ELITE*pro* ™

&

DATA*pro* ™

User's Manual

ELOG 2004™ Software

Including **AutoHost**™ 5.3

And **AutoPoll**™ 5.1

Software Release Date: February 11, 2004
Manual Revision Date: February 11, 2004

Congratulations!

You now own one of the world's most versatile, accurate, highest featured and lowest priced power/energy logger (**ELITE*pro*™**) or multiple purpose data logger (**DATA*pro*™**).

Both the **ELITE*pro*™** and the **DATA*pro*™** loggers share many features including the operating software, **ELOG 2004**™. This manual describes the software and operation of both loggers.

Most of the time, the description of features in this manual applies equally to both loggers. In some cases, a feature or description applies only to one logger. To provide clarity when that occurs, the logger type for which a description applies will appear in curly brackets such as: {**DATA*pro***}

Don't forget to fill in the warranty card for:

- *Continued Product Support*
- *New Product Features*
- *Metering Tips & Tricks, and*
- *Other Information That Makes Your Metering Projects More Interesting*!

What's New in ELOG 2004™?*

We've been busy! A number of new features have been added to ELOG. Some obvious and some subtle. Here is a description of the more obvious ones:

1. Peak kW Demand Register: Many ELITEpro customers have asked for additional features to make the ELITEpro more usable for electric bill reconciliation. To that end we have added a Peak kW Demand register to the ELITEpros. Now you can record kW Demand separately from the stored data in the logger! Requires Logger Firmware version 56 or higher.

2. Totalizers for kWh, kVAh, kVARh: Together with Peak kW Demand, separate accumulation registers for kWh, kVAh, and kVARh are stored in ELITEpro. Requires Logger Firmware version 56 or higher.

3. Line frequency measurement: Adding to the growing list of power quality features offered by the ELITEpro, now you can use ELITEs to measure line frequency!

4. Use with 400 Hz: Speaking of frequency, the ELITEpro can also be used for 400 Hz services. Just check the *50 Hz or 400 Hz* box in Line Frequency on the first page of the Setup Table.

By the way, did you know the ELITE has *always* been able to measure **DC voltages**?

5. Convert a .CSV file back to a .DAT: Sometimes it is useful to make a comma separated variable (CSV) file from the binary .dat data files that are downloaded from the loggers. With a .CSV file you can use Excel and other applications to do additional analysis. Now you have the option to convert the modified .CSV files back to a .dat. This new feature allows data editing.

6. Enhanced Simplified Interface: Do you ever wish you could use a different program (than ELOG) to talk to the loggers and retrieve data? You can! The Simplified Interface is designed so that any "terminal emulation device" (like HyperTerminal on your PC) can be used for many logger functions. A number of new Simple Interface commands have been added to the loggers. A list of the commands and how to use them is available separately from DENT Instruments. Requires firmware version 56 or higher.

7. Enhanced AutoHost: Now AutoHost saves the call logs for diagnosing inbound calls. In addition, the call logs contain more details about calls received.

A number of tweaks and enhancements have also been made to AutoHost making it even more user friendly and reliable even on noisy telephone lines.

8.+ Much More: As always, there have been a number of changes made to make the software a little more consistent, easier to use, and bug free. You'll probably not even notice most of these subtle improvements!

*These are new features added since ELOG 2003. For a list of all the features that have been added to previous versions of ELOG go to www.DentInstruments.com/ or give us a call.

Enjoy these new features.
As always, we appreciate your comments and suggestions!
541.388.4774 or
info@DENTInstruments.com

ELITE*pro*™ & DATA*pro*™ Logger
SAFETY SUMMARY
And SPECIFICATIONS

This general safety information is to be used by both the Logger operator and servicing personnel. DENT Instruments, Inc. assumes no liability for user's failure to comply with these safety guidelines.

The **DATA***pro*™ is an Over-voltage Category II device.
The **ELITE***pro*™ is an Over-voltage Category III device.

CAUTION: THIS LOGGER MAY CONTAIN LIFE THREATENING VOLTAGES. QUALIFIED PERSONNEL MUST DISCONNECT ALL HIGH VOLTAGE WIRING BEFORE USING OR SERVICING THE LOGGER.

⚠ Warning: Use of this device in a manner for which it is not intended may impair its means of protection.

SYMBOLS ON EQUIPMENT

⚠ Denotes caution. See manual for a description of the meanings.

⚠ When connecting the **ELITE*pro*™** Logger to an AC load, follow these steps in sequence to prevent a shock hazard.

1. Connect the CTs to the channel jacks on the Logger.
2. Connect the CTs to the phases being monitored.
3. If equipped with an external wall transformer, connect it next.
3. Connect the voltage leads to the different phases. **Connect the Ground (Green) wire first (if equipped), then the Neutral wire**, then the remaining phase wires in any order.

⚡ **DENOTES HIGH VOLTAGE. RISK OF ELECTRIC SHOCK. LIFE THREATENING VOLTAGES MAY BE PRESENT. QUALIFIED PERSONNEL ONLY.**

⚠ **ELITE*pro*™: DO NOT EXCEED 600V.** This logger is equipped to monitor loads up to 600V. Exceeding this voltage will cause damage to the logger and danger to the user. Always use a Potential Transformer (PT) for loads in excess of 600V. The ELITE Logger is a 600 Volt Over Voltage Category III device.

⚠ **USE SHUNTED CURRENT TRANSFORMERS (CTs).** Do not use unshunted CTs, only use shunted CTs with a 333mV maximum output. A serious shock hazard and logger damage can occur if unshunted CTs are used.

SENSOR LIMITATIONS:

Temperature: Use only 10 kohm NTC thermistors. Use of other sensors may damage the logger. Consult factory for suitability of non-DENT Instrument supplied sensors.

Pulse: Use only "dry contact" non-energized pulse inputs. Use of energized pulse initiators can cause damage to the logger and a potential shock hazard to the user.

Current: Use only shunted current transformers (CTs). The 4C **DATA***pro*™ uses shunted, voltage output current transformers. Do not use unshunted CT's, only use shunted CT's with a 333mV maximum output. A serious shock hazard and logger damage can occur if unshunted CTs are used.

Contains Lithium batteries. Dispose of properly.

Equipment protected throughout by double insulation (IEC 536 Class II)

No accessories are approved for use with the **ELITE***pro*™ or **DATA***pro*™ other than those specified in the DENT Instruments product literature and price sheets.

If the Logger appears damaged or defective, first disconnect all power and sensors from the logger. Then please call 541.388.4774, or email tech support mleno@dentinstruments.com for assistance.

*ELITE*pro *Technical Specifications*

3 Voltage Channels.....0-600 Volts AC or 0-800 Volts DC, Higher AC voltages can be measured with a Potential (voltage) Transformer

4 Current Channels.....0-333 mV AC or 0-600 mV DC, Corresponding to 0-6,000+ Amps depending on current transformer selected

Current Transformers.....Uses voltage output CTs (0-333mVAC) for maximum safety. Compatible with DENT Instruments **DATA***pro*™ and Energy Logger CTs

Measurement Type.....True RMS using high-speed digital signal processing (DSP)

Line Frequency.....60, 50, or 400 Hz and DC

Harmonic Sensitivity.....1st through 50th

Waveform Sampling.....128 times per cycle

Measurements.....Volts, Amps, kW, kVAR, kVA, and Power Factor
Maximum, Minimum, Average, (All Parameters) also kWh, kVARh, kVAh, Ah

Harmonics.....DC and Fundamental through 50th (odd and even), Total Harmonic Distortion, Crest Factor, for both Current and Voltage.

Waveform Capture.....Voltage, Current, Power

Accuracy.....Better Than 1% (<0.5% typical) for V, A, kW, kVAR, kVA, PF exclusive of sensor error

Resolution.....12 bit A/D plus sign (1 part in 4,096): 0.01 Amp, 0.1 Volt, 1 watt, 1 VAR, 1 VA, 0.01 Power Factor

Memory.....128 kBytes standard (~25,000 readings), or 512 kB (~100,000 readings)

Memory Types.....Ring (continuous, write newest over oldest), or Linear (stop when full)

Recording Intervals.....3, 15, 30 seconds, 1, 2, 5, 10, 15, 20, 30 minutes and 1, 12, 24 hours

Indicators.....2 LEDs: Green to signal when logging, Red to signal low battery

Communication

- **Direct**.....RS-232 to PC via 9 pin null modem cable
- **Communication Rate**....1200, 2400, 4800, 9600, 19200, 28800, 57600 baud
- **Modem**.....Internal 1200, 2400, 4800, 9600, 14400 baud, auto-answer, auto-dial modes
- **ELOG Software**.....Programs Logger, Displays Current Metered Values, Retrieves Data

Data Formats.....ASCII and Binary

Power.....Internal Lithium Battery; For external power use a Listed (US/Canada) or Certified (non-US) power supply rated 9 VDC minimum 150 mA and marked ‘Class 2,’ ‘Limited Power Source,’ or ‘LPS’

Battery Life..... ~3 years, LED indicator of low battery charge
Analog Sampling Rate..... 3 seconds on external DC power, 1 minute when on internal battery
Clock..... Crystal controlled internal Real Time Clock, 20 ppm (<1 min/month)
Mechanical
Operating Temperature . -7 to + 60 °C (20 to 140 °F)
Humidity..... 5% to 95% non-condensing
Enclosure..... Indoor: High Impact ABS Plastic, UL 94-V0 flame rating
Outdoor: Weather tight enclosure, Polycarbonate UL 94-V2 flame rating
Weight..... 0.4 kg (11 ounces) without modem
Dimensions..... 8 X 15 X 6 cm (3.2" X 5.9" X 2.4") Indoor Enclosure

Connections To The ELITE*pro*™

The **ELITE***pro* has four wire leads for making temporary connections to voltage sources. On the end panel with the voltage leads there is a two piece, eight (8) pin phoenix connector where sensors are terminated. The section with the screws and wire terminations may be removed by grasping both sides of the connector and pulling firmly away from the logger. Each pair of pins is a channel input as indicated on the logger. Of each pair, the left-most pin while facing the logger is the (+) or high side and the right-most pin is the (-) or low side. The 2nd, 4th, 6th and 8th pins are connected together and to the logger ground which is the same as the ground pin on the RS-232 port. The other end panel of the logger has a DB-9 connector that is the RS-232 serial port.

Two other connectors may appear on the long side of the logger. An RJ-11 jack provides access for a telephone line if the logger is equipped with a modem. A 3.5 mm jack is also provided to allow for connecting external DC power to the logger.

Minimum System Requirements For The ELITE*pro*™

Computer: IBM PC or equivalent
Operating System: Windows 95, 98, 2000, XP, NT 4.0 or higher
CPU: Pentium Class 100 MHz or higher recommended
RAM: 16MB minimum (32MB recommended)
Hard Drive: 5MB minimum available
Graphics: SVGA or higher resolution (800X600) required for Harmonic Analysis
Communications Port: One Serial Port or one USB Port (with adapter)
CD Drive: One CD or DVD drive required for software installation.

DATA*pro*™ Technical Specifications

Model 1T/3P: 1 Temperature & 3 Pulse Recording Channels

1 Temperature Channel....-40 to +70 °C (–40 to 160 °F) Extended Range Sensors: -50 to +125°C
.0.1 °C Resolution, Uses interchangeable, high-accuracy Thermistors

3 Pulse Channels.....Interrupt driven, Maximum input frequency 10 Hz

Model 2T/2P: 2 Temperature & 2 Pulse Recording Channels

2 Temperature Channels..-40 to +70 °C (–40 to 160 °F) Extended Range Sensors: -50 to +125°C
.0.1 °C resolution, Uses interchangeable, high-accuracy Thermistors

2 Pulse Channels.....Interrupt driven, Maximum input frequency 10 Hz, ±1 Count Resolution

Model 4C: 4 Channel Current Recorder

4 AC Current Channels ....0.05-6,000 Amps, Depending on Current Transformer, .01 A resolution

Current Transformers Uses voltage output CTs (0-333mV) for maximum safety. Compatible with DENT Instruments **ELITE***pro*™ and Energy Logger CTs

Measurements.....True RMS using high-speed digital signal processing (DSP) techniques

Line Frequency.....60, 50, or 400 Hz and DC

Harmonic Sensitivity.....1st through 50th

Waveform Sampling .....128 times per cycle

Model 4P: 4 Channel Pulse Recorder

4 Pulse Channels.....Interrupt driven, Maximum input frequency 10 Hz, Resolution ±1 Count

Model 4Vdc: 4 Channel Low Voltage DC Recorder

4 DC Voltage Channels ....0-10 Volts DC, 0.01V Resolution

Model 4Ma: 4 Channel Milliamp Recorder

4 Milliamp Channels .....4-20 mA or 0-25 mA inputs, 0.025mA Resolution

Model 4T: 4 Channel Temperature Recorder

4 Temperature Channels..-40 to +70 °C (–40 to 160 °F) Extended Range Sensors: -50 to +125°C
.0.1 °C resolution, Uses interchangeable, high-accuracy Thermistors

Specifications Common To All Models Of DATA*pro*™

Number of Channels..... 4

Measurements..... Maximum, Minimum, Average, Instantaneous (Temperature, Current, Milliamps and Volts DC), Count, Run-Time, Duty-Cycle, On-Time (Pulse/Digital)

Resolution..... 12 bit A/D Plus Sign (1 part in 4,096): 0.01 Amp, 0.1 °F or °C, 1 Count

Analog Sampling Rate..... 1 second on external DC power, 1 minute when on internal battery

Digital Sampling Rate ..... 10 Hz Maximum, Interrupt driven

Accuracy ..... Better Than 1% (<0.5% typical) exclusive of sensor error

Memory..... 128 kBytes standard (~25,000 readings), or 512 kB (~100,000 readings)

Memory Types ..... Ring (continuous, write newest over oldest), or Linear (stop when full)

Recording Intervals..... 3, 15, 30 seconds, 1, 2, 5, 10, 15, 20, 30 minutes and 1, 12, 24 hours

Indicators ..... 2 LEDs: Green to signal when logging, Red to signal low battery

Communication

- **Direct** ..... RS-232 to PC via 9 pin null modem cable
- **Communication Rate** ... 1200, 2400, 4800, 9600, 19200, 28800, 57600 baud
- **Modem**..... Internal 1200, 2400, 4800, 9600, 14400 baud, auto-answer, auto-dial
- **ELOG Software**..... Programs Logger, Displays Current Metered Values, Retrieves Data

Data Formats ..... ASCII and Binary

Power..... Internal Lithium Battery, For external power use a Listed (US/Canada) or Certified (non-US) power supply rated 9 VDC minimum 150 mA and marked 'Class 2,' 'Limited Power Source,' or 'LPS'

Battery Life..... ~3 years, LED indicator of low battery charge

Clock..... Crystal controlled internal Real Time Clock, 20 ppm (<1 min/month)

Mechanical

- **Operating Temperature** . -7 to + 60 °C (20 to 140 °F)
- **Humidity**..... 5% to 95% non-condensing
- **Enclosure**..... Indoor: High Impact ABS Plastic, UL 94-V0 flame rating
  Outdoor: Weather tight enclosure, Polycarbonate UL 94-V2 flame rating
- **Weight**..... 0.4 kg (11 ounces) without modem
- **Dimensions** ..... 8 X 15 X 6 cm (3.2" X 5.9" X 2.4") Indoor Enclosure

Connections To The DATA*pro*™

The **DATA*pro*™** has four connectors. On one of the two small ends of the logger there is a two-piece, eight (8) pin phoenix connector where sensors are terminated. The section with the screws and wire terminations may be removed by grasping both sides of the connector and pulling firmly away from the logger. Each pair of pins is a channel input as indicated on the logger. The left-most pin while facing the logger is the (+) or high side and the right-most pin is the (-) or low side The 2nd, 4th, 6th and 8th pins are connected together internally and also to the logger ground which is the same as the ground pin on the RS-232 port. If the logger accepts more than one type of sensor, the location and type of sensor is indicated on the logger panel as follows: T = Temperature sensor; P = Pulse or digital sensor, C = Current transformer.

The other small end-panel of the logger has a DB-9 connector, which is the RS-232 serial port. Two other connectors may appear on the long side of the logger. An RJ-11 jack provides access for a telephone line if the logger is equipped with a modem. A 3.5 mm jack is also provided to allow for connecting external 9VDC power to the logger.

Minimum System Requirements For The DATA*pro*™

Computer: IBM PC or equivalent

Operating System: Windows 95, 98, 2000, XP, NT 4.0 or higher

CPU: Pentium Class 100 MHz or higher recommended

RAM: 16MB minimum (32MB recommended)

Hard Drive: 5MB minimum available

Graphics: SVGA or higher resolution (800X600) required for Harmonic Analysis

Communications Port: One Serial Port or one USB Port (with adapter)

CD Drive: One CD or DVD drive required for software installation.

QUICK START

The Quick Start applies to both the ELITE*pro* and the DATA*pro* though the example given below is for an ELITE*pro*. Where the DATA*pro* differs significantly a note in curly brackets { } is shown.

Important: To set up the ELITE*pro* or DATA*pro* Logger for ANY monitoring session four things must be done.

1. **Current Transformers (CTs) must be connected to one or more of the channel inputs (unless doing voltage-only measurements); {DATA*pro* —connect any appropriate sensor}**
2. **Line Voltage connections must be made for *any* voltage *or* power measurements (but not for current only measurement); {DATA*pro*—not applicable}**
3. **A Setup Table that tells the Logger *how* and *what* to measure must be created and loaded into the Logger, and;**
4. **Data Logging must be turned "*ON*."**

This section will get you up and running quickly with your new Logger. You will learn how to set up a **Single Phase, 2 Wire** power measurement session using the ELITE*pro* Logger and ELOG software.

TECH TIP: To complete this Quick Start you do not need to have the ELITE*pro* Logger connected to an actual load. You can do a mock setup at your desk just to get a feel for how the computer software and logger work.

If you want to connect the ELITE*pro* to a load, see the section *Power Measurements, 1 Phase 2 Wire* for how to properly wire the current transformer (CT) and AC voltage input to the load. This Quick Start chapter assumes the CT and AC input are already connected to the load.

Connecting Current Transformers

Connect the CT to the green (Phoenix) connector on the logger end panel. Use the left-most pair of connections which is channel one. The high (+) wire of the CT (the white, banded or numbered wire depending on CT type) should go to the left screw terminal of each channel input. The low (-) CT wire (the black or unbanded wire) should go into the right screw terminal of the channel input. See also Section 3 Connecting Sensors And Configuring Channels.

Setting up the Logger using a Computer

Install Software: ELOG *2004*™

1. Place the ELOG CD (or Disk 1 if using floppies) into the appropriate drive.
2. The CD is auto-loading. Answer the questions on the screen.

[If Using floppy disks use Start; Run... A:\Setup.exe to start the installation]

Setting up an ELITE*pro*™ for a Single Phase, 2 Wire Load

1. Double click on the ELOG shortcut on the PC Desktop

   (Note: ELOG 2004™ works with Windows 95, 98, 2000 and NT program, but *not* Win 3.1)

2. With the ELOG 2004™ application open, click on **File**, then **New, Setup Table File, Ok**

3. At **Select a Setup Table Type** choose the type of Logger: ELITEpro™ (4 Channel) and click **Ok**

4. Set **Integration Period** to 1 Minute (or other as desired)

5. Set the **Line Frequency** to 50 or 60 Hz as appropriate

6. (Optional) Under the **Setup Table Description**, type "Quick Start Setup," Click the Next button

7. Next click on the Single Phase Two Wire speed button:

8. Enter the current transformer (CT) value corresponding to the CT chosen. The CT value is the maximum input (primary) rating of the CT in amperes and is printed on the CT, then click **OK**.

9. (Optional) Select **Name** with mouse, then type "110V Load"

10. Click anywhere in the white box under **Volts** button, and then choose **A-Average** or other parameters to be recorded as desired.

11. Repeat the selection for **Amps**, **kW** (kilowatts), **kVA** (kilovolt-amps), **PF** (power factor), and **kVAR** (kilovolt-amps reactive). You can choose any combination of values to record: Average, Minimum, Maximum, and Integrated average (e.g., kWh). You may need to use the scroll bar at the bottom of the screen to access power factor (PF) and kVAR.

12. Use **File**, **Save As** to save the Setup Table to the computer hard disk, name the table "Sample"

Downloading the Setup table into the Logger

1. Connect the null modem, RS-232 cable into the serial port on your computer. Then connect the other end of the cable into the DB 9-pin connector on the logger that is labeled RS-232. (See the Application Notes for tips on using a USB port.)

2. From the software main menu, select **Logger; Communication; Direct Connect (Null Modem Cable).**

3. The connect message should appear. If it does not, click on **Tool; PC Setup...** and change the Direct Connect variables as appropriate. The most frequent problem is that the wrong communication port (Com 1, Com 2…) or baud rate (1200, 2400,…) is specified. See also the *Most Commonly Asked Questions* section of this manual.

4. After connecting to the logger, click on the Send to Logger button.

5. Select **Overwrite ACTIVE Table.**

   ELOG 2004™ automatically initiates logging when a Setup Table is downloaded to the Logger. At the prompt select: **Continue Logging**.

6. You are now collecting data!

7. Use **Logger; Display Present Readings; Show As Text** to view the real-time values being measured by the Logger.

Note: When the logger is not in use, Data Logging should be turned off to conserve the battery.

Retrieving and Viewing the Data

1. Allow the logger to collect several minutes of data.

2. If the PC is still connected to the logger with the serial cable, click on **Logger; Retrieve Data…**

3. After retrieving the data, click on **File; Open; Data File; Ok** and select the file just downloaded.

4. Use the **Data; Create New Graph…** command to make graphs of the data as desired.

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SETTING UP AND USING

THE ELITE*pro*™ and DATA*pro*™ LOGGERS

Introduction

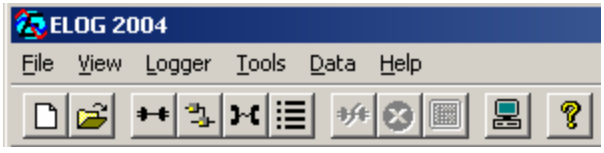
The **ELITE***pro* and **DATA***pro* instruments are interval data recorders that can be used to measure and record a wide variety of physical parameters (volts, watts, temperature, 4-20 mA and more). Despite their small size and relatively low-cost, these instruments are very sophisticated, accurate and versatile.

The measurements are stored in on-board memory in a time series format, or time bins, at an interval selected by the user. The time bins can be as short as every 3 seconds or as long as every 24 hours. Regardless of the storage interval selected, the logger is sampling its sensors every three seconds when on external power from the included wall transformer or every minute when using its internal battery. These readings are then used to determine the average (or maximum or minimum) value that is stored in each time bin.

The Loggers require a computer (PC) and special software (ELOG) for initial setup and later data retrieval and analysis. To use the ELOG software it must first be installed on your computer. Do this by putting the CD into the appropriate drive (or Disk 1 if using floppies). The CD is auto-loading so simply follow the directions on the screen.

When the ELOG software is run, the MAIN MENU will appear which consists of one line of standard Windows menus structures and a lower line of "hot buttons" that can access many of the most commonly used software functions with just one click of the mouse.

MAIN MENU



Step 1: Communicating with the Logger — Direct Serial Connection

Since the **ELITE***pro* and **DATA***pro* Loggers have no direct user interface on them, all communication must happen through a PC using either the serial port on the logger or through the internal modem, if equipped. If desired, a USB port on your PC may also be used. See the **Application Notes** for a description.

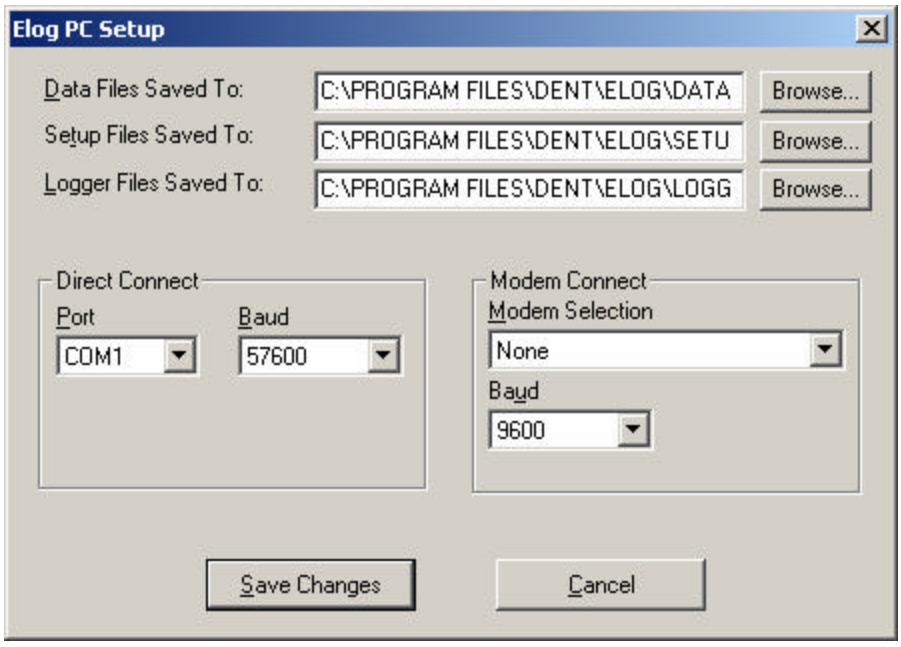
If equipped with a modem, see the section *Remote Communication Via Telephone* at the end of this chapter for more details on using modems.

If communication is over an Ethernet LAN, see the section *Communication Via Local Area Network (Ethernet)* also at the end of this chapter.

To make a direct connection from the PC to the logger, use the supplied ***null modem cable*** to connect from the logger's serial port (a DB-9 connector) to the serial port on the PC. If necessary, use a 9 to 25 pin adapter on the PC.

TECH TIP: *Most communication problems are a result of ELOG trying to communicate with the logger at the wrong speed or from the wrong computer port. Use Tools, PC Setup to change these values.*

Start the ELOG software and select **Tools; PC Setup…** from the menu. A screen similar to the one below will appear:



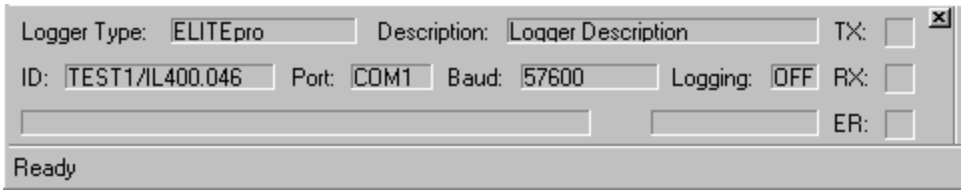
In the lower left-hand box, **Direct Connect**, configure the computer serial connection. Verify that the com port corresponding to where the serial cable is connected on the PC is selected (COM 1, 2, 3 or 4) and that the baud rate is set to that of the logger (1200, 2400, 4800, 9600, 14400, 19200, 28800 or 57600).

The default baud rate for the loggers is 57,600. ELOG does have an automatic baud search feature, which it will use if the first connection attempt does not succeed.

TECH TIP**: Quickly set up the PC by clicking on the* ***PC Setup *button on the screen.*

After configuring the PC, use **Logger; Communication; Direct Connect (Null Modem Cable)** to connect the PC to the logger.

A connect message similar to the one below will appear on the bottom of the screen:



Use **Logger; Connection; Terminate Connection** to end the communication with the logger.

TECH TIP:** To quickly connect, use the* ***Direct Connect *hot button on the screen and use the* ***Disconnect*** *hot button to disconnect from the logger.*

Step 2: Setting Up The Logger For A Metering Session

"Setup Table" is the name given to the file that is used to configure the Logger for a monitoring session. The **ELITE***pro* and **DATA***pro* Loggers are very flexible meters that can monitor a wide variety of parameters using a large number of different sensors {**DATA***pro***s**} and over a wide range of currents, voltages and service types {**ELITE***pro*}. A meter that is this flexible must be "told" how the operator wants it to be used, what it is to record, and at what intervals. The file that contains this information is called a Setup Table.

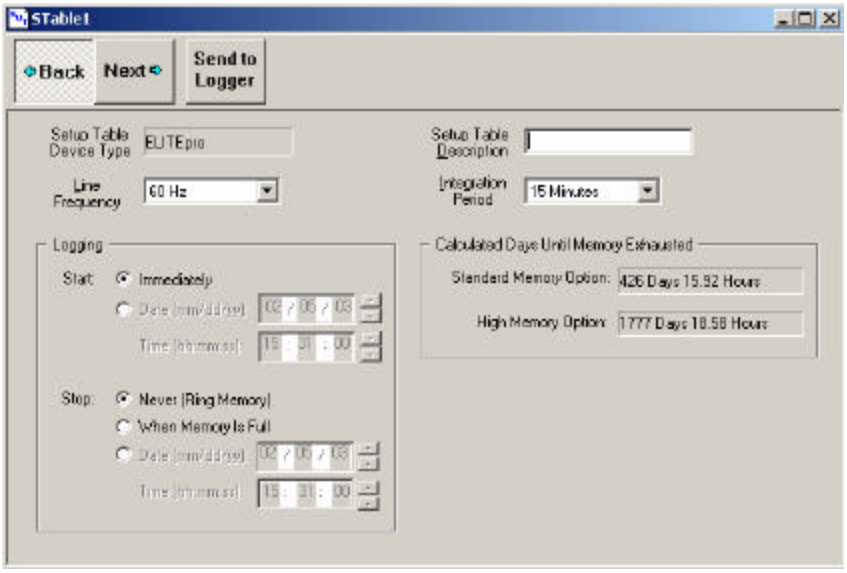
Setup Tables are created on the PC and then stored on the hard disk (or floppy disk) with a .sut file name extension. From there they may be stored in the Logger immediately or at a later time (but prior to beginning the monitoring session). Once created, a Setup Table may be stored on the PC hard disk and sent into any number of loggers. Setup Tables may also be retrieved from a Logger, modified if desired, saved or resent to the logger.

> ***TECH TIP:*** *It is usually best to communicate at the highest baud rate possible. For a direct or network connection that is 57,600 baud. If the logger is not already set to 57600, use the menu item* ***Logger; Logger Baud Rate…*** *to change the logger to 57,600. You will then be prompted to update the PC baud rate as well. Click* ***Match Baud Rates****. Maximum modem communication speed is 14400 baud.*

New and saved (on the PC) Setup Tables are accessed through the **File; New** or **File; Open** commands respectively. To access a Setup Table in a logger, first connect the PC to the logger as described above and then use the menu command **Logger; Retrieve Logger Setup Table** to view, edit, save to disk or resend to the logger after modifying.

When using **File; New** or **File; Open** the first window asks what kind of file you want to open or create. Choose **Setup Table File**, then **OK**.

Creating a New Setup Table: The ELOG software works with a variety of DENT Instruments products (including **ELITE***pro* and **DATA***pro* Loggers). When creating a new Setup Table, the software first asks for what device. f the logger type you wish to configure is not shown in the window, use the arrow key to open the drop-down box and select the correct logger type. If you are currently connected to a logger, the software will assume that you want to create a Setup Table for *that device and will not prompt you for a logger type*. Selecting **New** will bring a Setup Table with default parameters as described below.



Opening an Existing Setup Table: After clicking on **File; Open** and selecting **Setup Table File,** a folder window will appear from which you may navigate to find the Setup Table you desire. The default folder is set from the **Tools; PC Setup** menu.

The Setup Table consists of two "pages" that are accessed by clicking on the Back or Next buttons located in the "hot button" line at the top of the screen or by using Ctrl + Page Up or Ctrl + Page Down.

Page 1, LOGGER SETUP: This page allows you to define generic Logger attributes:

Setup Table File Name: (Stable1 in this example) The Table name is not editable from this menu but may be changed when the Table is saved to the hard disk using either the **Save** (first time) or **Save As** buttons.

Setup Table Device Type: This shows what type of Logger for which the table was configured (**ELITE*pro***, **DATA*pro*** **1T/3P**, etc.). It is also not editable and is determined when the setup table type is selected.

Setup Table Description: (Optional) User-defined description of the Setup Table (20 character limit). This is helpful for the user to identify different Setup Tables.

Line Frequency: 60 Hz or 50/400 Hz. Default is 60 Hz. (Note: this field does not appear with all logger types)

Integration Period: This tells the logger at what time intervals data is to be stored in the memory. For example, if the integration period is set for 30 minutes and average watts is being monitored, then every 30 minutes the logger will record in its memory the average power use (watts) for that channel over the preceding 30 minute interval, based on about 600 measurements of the monitored power draw. If Maximum (and/or Minimum) values are being recorded the highest (and/or lowest) of those 600 readings will also be saved.

The default integration period is fifteen minutes. The choices are 3, 15, 30 seconds, 1, 2, 5, 10, 15, 20 and 30 minutes, 1, 12 and 24 hours.

LOGGING

This feature controls when the logger will begin collecting data and when it will stop. The default values are start logging immediately (as soon as the setup table is sent to the logger) and to stop logging never.

Logging Stop: Never (Ring Memory) means the memory is set in a “Ring” or continuous loop. When the memory fills, the oldest records will be replaced with the newest records. This is also called circular memory. It is most useful for long term metering projects.

Logging Stop: When Memory Is Full may also be set to stop logging when the logger memory fills, this is “Linear**”** memory and is also known as "stop when full."

Delayed Logging Start/Stop: Another option is to set the recorder to start and/or stop logging at a future date and time. Simply click the button next to the delayed start or stop and enter the date and time desired. Times should be set in a 24 hour format, e.g., 2:30 pm should be entered as 14:30.

CALCULATED DAYS UNTIL MEMORY EXHAUSTED

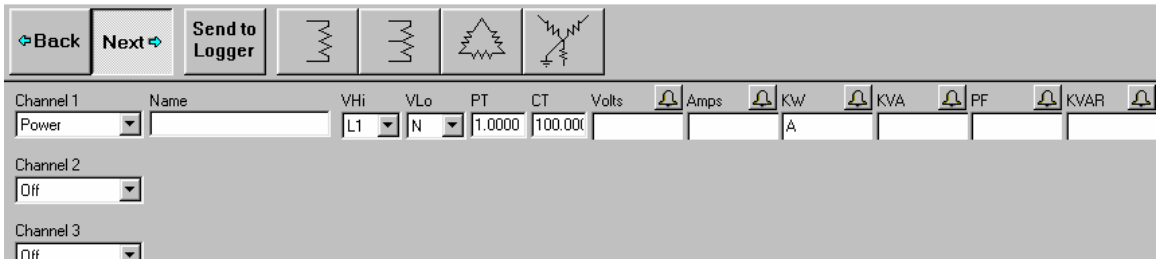
ELOG provides a convenient feature that calculates the length of time required to fill the memory for any setup table. The feature is dynamic so that any time any parameter in setup table affecting the memory duration is changed, then the Calculated Days Until Memory Exhausted is updated. This allows the operator to know in advance how long the memory will last.

Select **with your mouse or use the Page Down key to go to the next screen.**

Page 2, CHANNEL SETUP: The **ELITE***pro* and **DATA***pro* Loggers have four configurable hardware channels corresponding to the current transformers {**ELITE***pro*} or other sensors {**DATA***pro*}. The second page is different for the two kinds of loggers and described separately below.

ELITE*pro* CHANNEL SETUP: Any combination of volts (V), amps (A), power (kW), volt-amps (kVA), volt-amps-reactive (kVAR), and power factor can be recorded for each power channel. See the specific sections of *CONNECTING SENSORS AND CONFIGURING CHANNELS: Power Measurements* for how to properly configure the Setup Table for single-phase, 3-phase 3-wire, 3-phase 4-wire services.

Click on the ▼ by each channel and then click **Power** to turn on each channel as desired. These channels refer to the current transformer inputs {ELITEpro} or sensor inputs {DATApro}. It is usually helpful to click on the maximize button in the upper right hand corner of the Setup Table window.



Configuring a Power Channel

When configuring the power channel, the following options can be set:

Name: (Optional) Name the channel so it best describes the location or item being monitored, such as "Water Heater" or "Pump L1 Phase" (20 characters maximum).

VHi: High-side voltage. This is the "high" voltage that will be measured with respect to the reference "low" voltage (VLo). Choices are: L1, L2, L3, Neutral.

VLo: Low-side voltage; reference for AC voltage. Choices are: L1, L2, L3, Neutral.

PT: Potential Transformer turns ratio. This is used when a step-down transformer is needed to measure AC voltages greater than 600V. The default is 1.000. See *Monitoring Voltages Greater Than 600V* for use of this parameter.

CT: The primary current rating of the current transformer. The default is 100 amps. The value to be used is printed on the CT.

Volts, Amps, KW, KVA, PF, and KVAR: To record any or all of these values, use the mouse to select the Average, Minimum, Maximum, integrated hourly value and/or Instantaneous recording flags. To access KW, PF, KVAR and the Notes, if not shown on the screen, use the mouse to click on the right arrow of the scroll bar at the bottom of the screen.

Notes: (Optional) 80 characters for notes.

(Optional) Sets high and low alarm conditions. See also, the section on Alarms

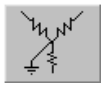
Power Summation Channels: Channels 5 and 6 are called *Power Summation Channels.* They combine the data from 2 or more power channels (also called "hardware" or "physical channels") and are used primarily for calculating *total system* volts, amps, kW, kVA, power factor, and kVAr in polyphase or multiple single phase systems. Channel 5 *automatically* appears when 2 power channels are turned "on." When 3 or 4 power channels are turned "on," Channel 6 will also *automatically* appear in the setup table.

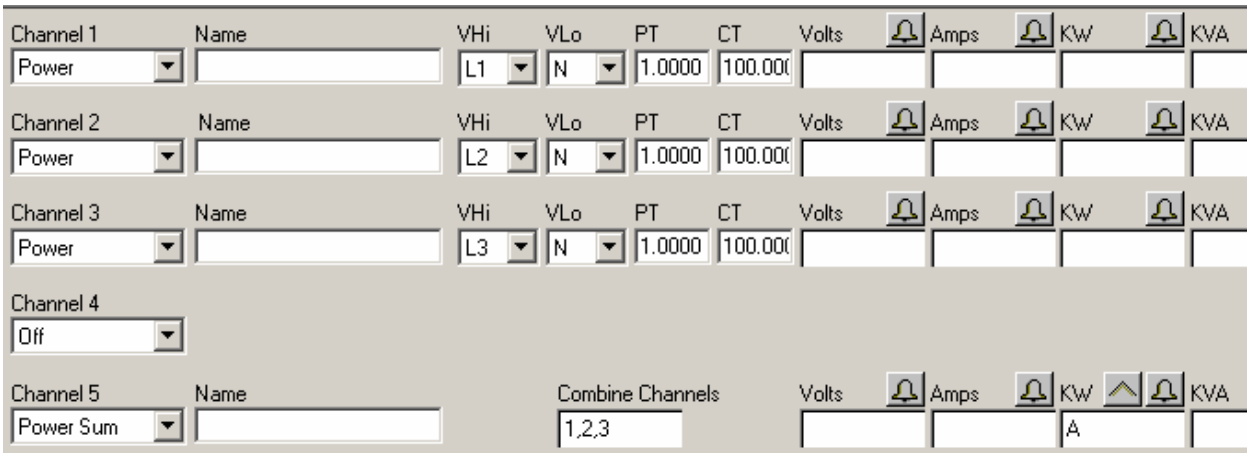
TECH TIP: *If only 1 power channel is turned on, then Channels 5 and 6 will* ***not*** *appear on the computer screen. If 2 power channels are turned on, then only Channel 5 will appear.*

The Power Summation Channels are most often used to record total system power parameters on three phase loads. They may also be used to optimize the memory of the Logger. Instead of collecting data from two (or more) separate channels, the Power Summation Channel(s) can be configured to collect and combine the data from 2 or more channels.

To combine channels and maximize memory use, turn off all of the recording flags for the individual hardware channels (Volts, Amps, kW, kVA, PF, and kVAR). Default recording flags are Average Watts. At the Power Summation Channel, select the channels to be added in the **Combine Channels** box and then set the recording flags as desired.

Example Setup Table for a 3-phase 4-wire (Wye) connected load using Power Summation Channels to optimize Logger Memory.

Use the speed button  on the second page of the Setup Table to quickly create the 3-phase 4-wire setup. At the prompt, enter the size (primary current rating) of the three CTs that will be used. The following setup table will be created:



NOTE: *To view PF, kVAR, and Channel Notes to the right of the screen, use the scroll bar at the bottom.*

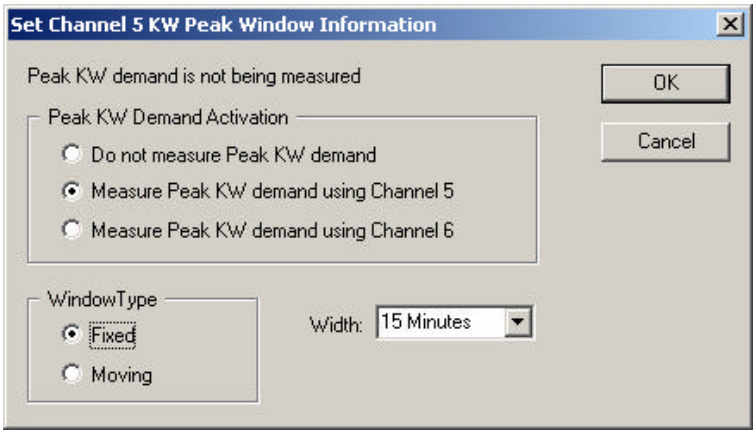
When finished with the channel definition page of the Setup Table, use the Send to Logger button to send the Setup Table to the logger and make it the active table. You may also use **File; Save** (to disk), or **Save As** (to disk with a different name or folder) if you also desire to keep the Setup Table on the PC. Once sent to the logger, it may also be retrieved, edited or saved using **Logger; Retrieve Logger Setup Tables**.

TECH TIP: *If a standard setup table is created using one of the speed buttons, then a new speed button appears* View Typical Setup *. This button, when clicked will produce a schematic image of how to connect the ELITEpro to a load. It can be printed and carried into the field for easy reference during installation.*

KWh, kVAh, and kVARh Totalizer Registers {ELITEpro only}: Whenever any recording flag (Average, Minimum, Maximum, or Total) for any parameter (kW, kVA, or kVAR) is turned on for channels 5 or 6 then the totalizer (cumulative kWh, kVAh, and kVARh) for that channel and that parameter is also active. The Peak kW Demand and Totalizer registers apply only to summation channels 5 and 6. The values are shown in the Data File Summary which is generated from a downloaded data file. See also the description of Data File Summary in the Data section.

Peak kW Demand Register: The Peak kW Demand Register is set by clicking on the "peak" symbol, , shown in the Channel 5 & 6 kW recording flag area. A new window then opens to set the desired Peak kW options.

Only one channel of Peak kW Demand can be set at a time. Either Channel 5 or Channel 6 but not both.



> ***TECH TIP:*** *For single phase loads set channel 5 to be the "sum" of channel 1only (or other single channel) to get Peak kW Demand.*

The Peak kW offers two types of "Windows," Fixed and Moving. A fixed demand window means that the window occurs at the same place within the hour. For example, a 15 minute demand window would always have a time stamp of xx:00, or xx:15, or xx:30, or xx:45.

A Moving demand window, in contrast, could be any rolling 15 minute (for example) period in the hour. So, the Moving window can have a time stamp of xx:00, xx:01, xx:02, xx:03, …xx:59.

> ***Note:*** *The time stamp associated with a Peak kW Demand in the Data File Summary is the beginning time of the peak period.*

What is the difference? The Moving window is more accurate than the fixed. For example, a peak 15 minute demand may actually occur over a period that spans 6 minutes before the hour to 9 minutes after the hour. A fixed window would "split" that demand over the xx:45 and the xx:00 periods and report whichever is highest. The moving window would accurately capture the true 15 minute peak. The moving window Peak kW Demand is almost always larger than the Fixed window Peak kW.

Why use one type over the other? The Moving window is more accurate than the Fixed window and also better replicates the kW Peak as indicated by older style thermal demand meters. However, many modern electronic meters do not have the capability to measure Peak kW Demand with a moving window. If it is desired that the ELITEpro data be compared to a utility meter, the ELITEpro can be set to match whichever method the utility meter uses.

The width of the Peak kW Demand window is also selectable. There are 12 choices available from 1 minute to 60 minutes. The most common demand interval is 15 minutes and that is the ELOG default setting.

> ***Note:*** *The width of the Peak kW Demand window is independent of the Integration interval. For example, the ELITEpro could be set to a 1 hour integration interval but still record the highest 15 minute demand.*

DATA*pro* CHANNEL SETUP: All **DATA*pros*** have 4 input channels and come in a variety of dedicated "flavors." Currently available models include the:

1T/3P	(1 temperature measurement channel and 3 pulse counters)
2T/2P	(2 temperature and 2 pulse counters)
4T	(4, Temperature Channels)
4C	(4, AC current measurements)
4M	(4, 0-25 ma or 4-20 ma inputs)
4V	(4, 0-10Vdc inputs)
4P	(4, pulse counters)

Consult with DENT Instruments for availability of other types of **DATA*pros***.

A variety of parameters can be monitored with the **DATA*pros*** including pulse counting from pulse initiating meters (gas, electric, water, steam), temperature, AC current, and process signals such as 4-20 mA and 0-5 or 0-10 Vdc. See also the section **DATA*pro*: CONNECTING SENSORS AND CONFIGURING CHANNELS.**

> ***TECH TIP:*** *It is usually helpful to click on the maximize button in the upper right hand corner of the Setup Table window.*

Click on the ▼ by each channel in the Setup Table and then the sensor type (Temperature, 4-20mA and so on) to turn on each channel as desired.

Examples of the "Page 2" of the **DATA*pro*** Setup Tables are shown below:

For Temperature and Pulse Loggers (Models 1T/3P, 2T/3P, 4T, and 4P)

Channel 1	Name	Slope	Offset	Units	Record	Channel 1 Notes
Temperature	Sample Temperature	1.0000	0.0000	Fahrenheit	A	

Channel 2	Name	Sensor	Scale	Units	Record	Channel 2 Notes
Contact/Pulse	Sample Pulse Counter		1.0000		C	

For 4-20 and 0-25 mA Loggers (Model 4M)

Channel 1	Name	Sensor	Slope	Offset	Units	Record	Channel 1 Notes
4 - 20mA	4-20 mA Sensor		1.0000	0.0000	Units	A	

Channel 2	Name	Sensor	Slope	Offset	Units	Record	Channel 2 Notes
0 - 25mA	0-25 mA Sensor		1.0000	0.0000	Units	A	

For AC Current Loggers (Model 4C)

Channel 1	Name	CT	Record	Channel 1 Notes
Current	AC Current	100.00	A	

For DC Voltage Loggers (Model 4V)

Channel 1	Name	Sensor	Slope	Offset	Units	Record	Channel 1 Notes
0 - 10Vdc	0-10 Vdc Sensor	Any	1.0000	0.0000	VoltsDC	A	

Configuring a DATA*pro*™ Channel

When configuring the power channel, the following options can be set:

Name: (Optional) Name the channel so it best describes the location or item being monitored, such as "Water Temperature" or "Pump L1 Phase" (20 characters maximum).

Slope: When scaling is required to convert raw sensor output (such as millivolts) into engineering units (such as pressure) slope and offset may be used. [Not on Pulse or CT channels]

Offset: Used with Slope to scale the raw sensor output into engineering units. [Not on Pulse or CT channels]

Scale: Scale factor for pulse channels to convert raw pulses into engineering units. [Pulse channels only]

Units: (Optional) Use this field to specify the engineering units that will appear as a column heading with the data.

CT: The primary current rating of the current transformer. The default is 100 amps. The value to be used is printed on the CT. {**DATA***pro* **4C** only}

Record: To record any or all of these values, use the mouse to select the Average, Minimum, Maximum, Integrated hourly value {4C} or Instantaneous recording flags.

Notes: (Optional) 80 characters for notes.

Sets high and low alarm conditions. See also, the section on Alarms

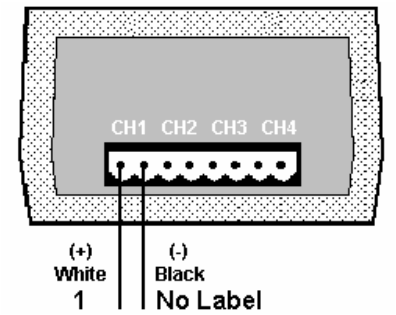
See also Section 4, **DATA*pro* CONNECTING SENSORS AND CONFIGURING CHANNELS** for more information on using the DATApros.

Step 3: Connecting The ELITE*pro*™ To A Load

This section is intended to provide a brief overview. See also Section 3, **ELITE*pro*: CONNECTING SENSORS AND CONFIGURING CHANNELS** for a more detailed treatment.

CAUTION: THIS LOGGER MAY CONTAIN LIFE THREATENING VOLTAGES. QUALIFIED PERSONNEL MUST DISCONNECT ALL HIGH VOLTAGE WIRING BEFORE USING OR SERVICING THE LOGGER. OBSERVE ALL CAUTION AND WARNINGS DESCRIBED IN THE SAFETY SECTION AT THE BEGINNING OF THIS MANUAL.

After storing a Setup Table into the logger it may be connected to a load for measurement. First connect the Current Transformers (CTs) to the appropriate channels on the Logger. ELITE*pro*s use CTs with stripped and tinned, bare terminated wires. The CT leads need to be connected to the green Phoenix termination block as shown in the diagram below using a small screwdriver:



Each channel consists of two terminals or pins. For each channel, the left connector pin is the positive or high-side wire and the right pin is the negative or low-side. When using DENT Instrument

supplied current transformers, connect them as follows:

Split-core CTs (removable leg)—The white CT wire is (+) and the black wire is (-).

Clamp-on CTs (clothes-pin type)—The banded wire with a number one (1) is the (+) wire and the unbanded wire is (-).

NOTE: *Correct polarity is required to insure proper phasing of the CT.*

Next connect the CTs to the phases being monitored. Be careful to observe proper CT orientation. If an arrow is shown on the CT label, it should be pointed towards the load. Otherwise, use the instructions printed on the CT.

If equipped with an external wall transformer, connect it next.

Lastly, connect the voltage leads to the different phases. Connect the White, Neutral wire, first then the remaining voltage sense (phase) wires.

ELITE*pro*™ and DATA*pro*™

Turning Logging (data collection) On and Off: When a Setup Table is stored in a logger, data logging automatically begins unless canceled by the user or the delayed logging start feature is used. At any other time, logging may be turned on or off by use of the Logger; Logging ON/OFF… menu command. When logging is on, the green LED on the logger end-panel should flash every 5 seconds.

TECH TIP: *When not in use, Logging should be turned off to extend the battery life*.

Clearing Logger Memory: Use the menu command **Logger; Clear Logger Memory…** to reset the logger memory before a monitoring session.

Setting the Logger's Real Time Clock: The **ELITE***pro* logger has an internal, crystal-controlled real-time clock. To set the clock's date and time, use the menu command Logger; Logger Clock. You may set the clock manually or have it automatically synchronized to the PC's internal clock.

NOTE: *The logger clock can only be set using a MM/DD/YY HH:MM:SS format and uses a 24 hour (military) format. For example, 6 pm should be represented as 18:00. Entering 6 for the hour is interpreted as 06:00 or 6 am.*

Editing The Logger Description Line: The logger has the provision for an optional 20 character description that stays in the logger. The description line is often used to identify a logger, the logger location or the load the logger is monitoring. Use Logger; Edit Logger Description Line to change the description.

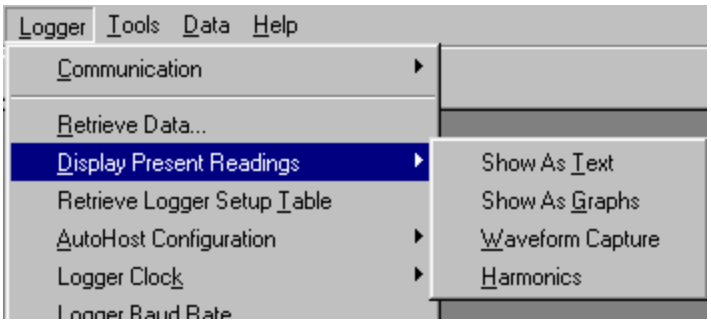
Step 4: Verifying Installation and Viewing Data In Real Time

Viewing Data In Real Time includes viewing the parameters that may be recorded such as Temperature, volts, amps, kW, kVAR, kVA, and power factor. With the **ELITE***pro* it is also possible to view the actual voltage, current and power waveforms as well as the harmonic values out to the 63rd order and Total harmonic Distortion (THD), Crest Factor, and Peak Value.

Viewing Recorded Parameters

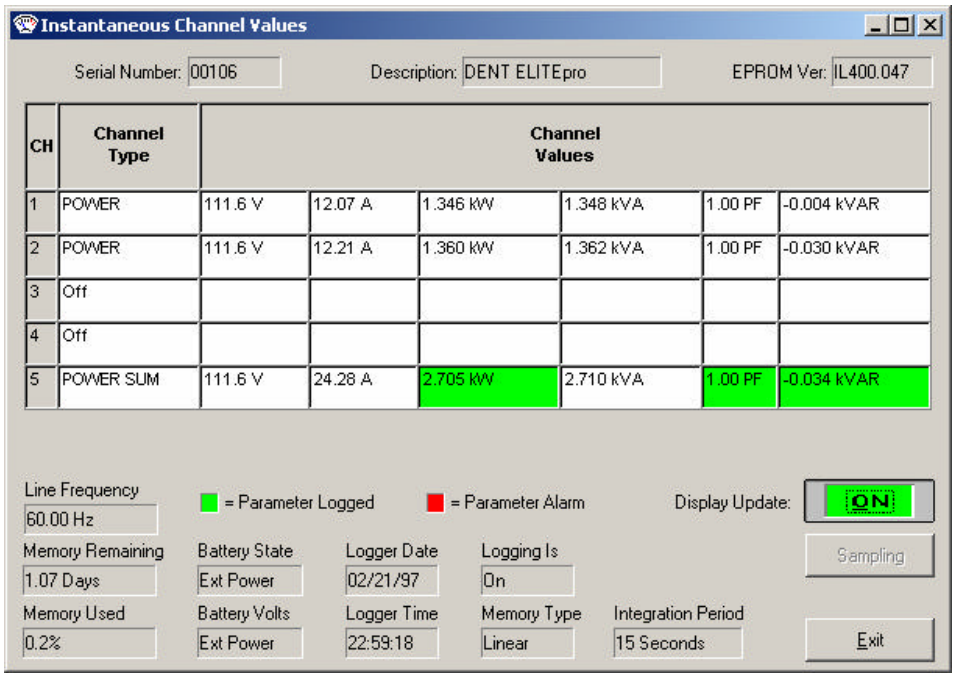
The recorded parameters may be viewed in either a graphical or text format. Graphical is most useful for watching long-term trends of a single parameter. The graphical format can be thought of as a electronic, paperless chart recorder. The text format is most useful for viewing all parameters measured by the logger (even those not being recorded) and is often used for verifying proper installation of the logger.

After connecting the logger to a load, it is often useful to look at the parameters the logger is measuring. Connect a PC to the logger serial port and establish a direct connection. Then, using Logger; Display Present Readings, the current values on the logger inputs can be seen through one of four choices.



Show As Text: When this option is selected, a screen similar to the one below is shown {**ELITE***pro*}. All of the channels that are turned on are displayed simultaneously. If the parameter is being recorded by the logger, it will be shaded (green in color screens), as are the kW values shown below. For a Power Channel, that means you will be able to see all six power parameters (V, A, kW, kVA, PF, and kVAR) even if only one of the parameters is being recorded. For a **DATA***pro* channel there is only one column of data displayed and up to four rows (one for each channel).

This feature is very useful for verifying correct installation of the Logger.



This screen provides information about:

- The real-time data (which can be paused for cross-channel comparisons);
- The Line Frequency as measured from Channel 1 on L1;
- How many days the memory has remaining before filling;
- The logger battery condition (and if equipped, internal modem battery);
- The logger clock's current date and time;
- Whether or not the data logging is turned on;
- How much memory has been used;
- Type of memory: Linear (Stop When Full) or Ring (Continuous);
- The integration period, and;
- If a measurement is an alarm condition.

TECH TIP: *{**ELITE**pro or **DATA**pro **4C**} If no current transformer is connected to a channel that is turned "on," nonzero readings will be displayed. You can use this feature to verify a current transformer connection. If the CT is connected but shows a "0" for a value, then the CT is probably connected but the monitored load is turned off. On the other hand if a constant (usually unreasonably high) value for current is displayed, a CT wire may have come off of the logger.*

Use Display Present Readings To Verify Correct Installation

The Display Present Readings feature may also be use to verify the proper installation of the logger. This is particularly important for the **ELITE***pros* where the number of CT and voltage connections increases the chance of an incorrect connection. Using the **Display Present Readings | Show As Text** command. All measured parameters, whether being recorded or not, are displayed. Look for wattages (including sign) and power factor that makes sense.

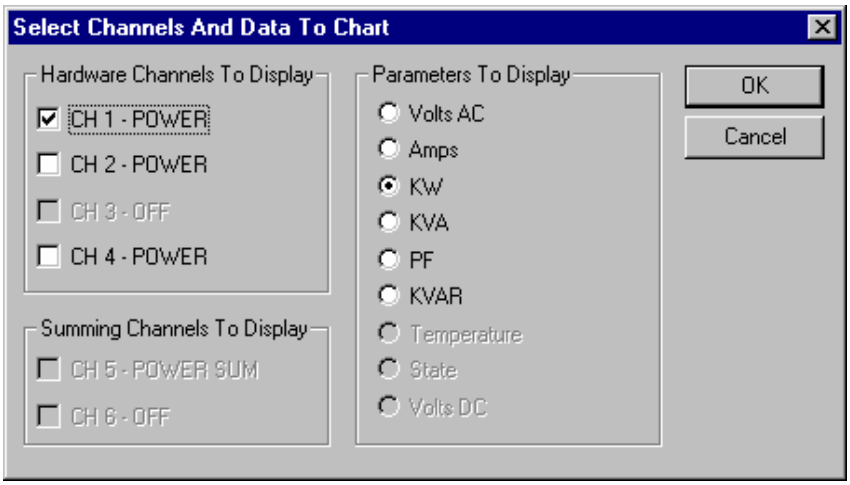
For example, In a single phase 2- or 3-wire or three phase 4-wire installation, the kW reading for each channel and any Power Sum channels should be positive. A negative kW reading usually implies that a CT is placed backward on the wire. It may also mean that the load being measured is actually *supplying* electricity, as from a generator. This is often seen in solar and wind generator systems or where there are backup generators when they are tested.

> ***TECH TIP:*** *For three phase 3-wire systems when using the two watt-element monitoring approach, a negative kW on any phase may not be a problem. If the three phase system's average power factor is less than 0.66, then the kW on one of the phases will be negative. This is normal. In this case, the combined channel (5 or 6) total kW should still be positive.*

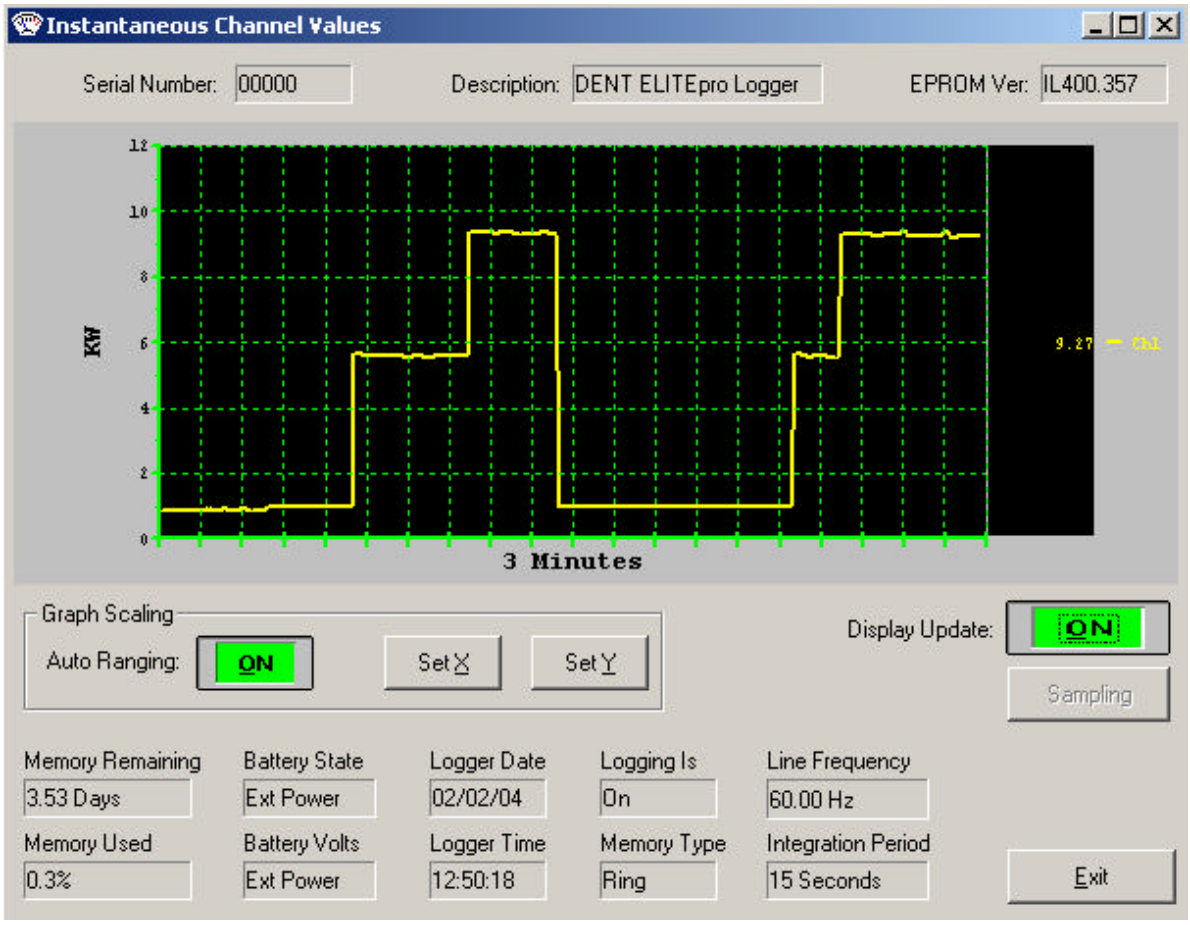
Also look at the power factor readings. These numbers phase and total for 2 and 3-wire single phase systems and all 4-wire systems) should be a reasonable number. Reasonable depends on the load being monitored but typically .8 – 1.0 is seen. For 3 phase 3-wire systems the channel 5 or 6 total power factor should also be a reasonable number.

Discerning a problem through power factor measurement alone is difficult as a load that is dominated by unloaded motors can have power factors below 0.6. Usually, power factor readings below 0.4 indicate the voltage lead is not connected to the same phase that the CT is connected to.

Show As Graphs: This feature is similar to the text version described above but shows the data in a graphical format. After selecting this option, a screen such as the one on the next page appears. Among the hardware channels to display will be all of the channels that are currently turned on in the logger. Selecting one or more Hardware Channels makes the **Parameters To Display** panel active and you may choose one variable to graph. You can only choose one variable at a time unlike the text option where you will see all parameters displayed simultaneously. This is because of differences in scaling and to reduce clutter on the graph. For example, you could display kW from 4 channels simultaneously but not kW and KVAR even if from the same channel.



After selecting **OK,** a graph similar to the following appears:

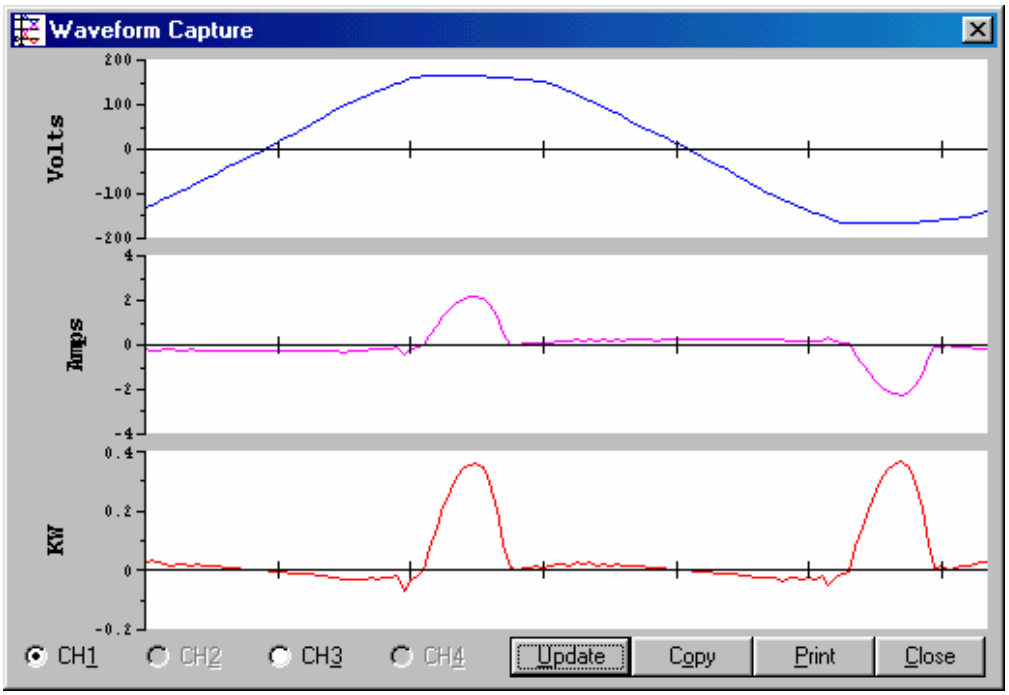


This graphical presentation is very similar to paper strip chart recorders. The graph begins on the left edge and moves to the right. Upon reaching the right edge, the whole graph scrolls to the left with each new reading so that the most current data values are always shown and the older points slide off the left edge. By using the **Set X** feature, the amount of data shown can be varied from 1 second to more than 18 hours (65 000 seconds). Keep in mind that the X-axis scaling is only approximate.

The **Set X** and **Set Y** features can be used to set the scaling, colors, and line type (e.g., linear or logarithmic) and the number of grid lines that overlay the graph.

Viewing Voltage and Current Waveforms {ELITE*pro* only}

Use the software command **Logger**; **Display Present Readings; Waveform Capture** to see the actual current, voltage and power waveform. A typical (highly distorted) display is shown below:

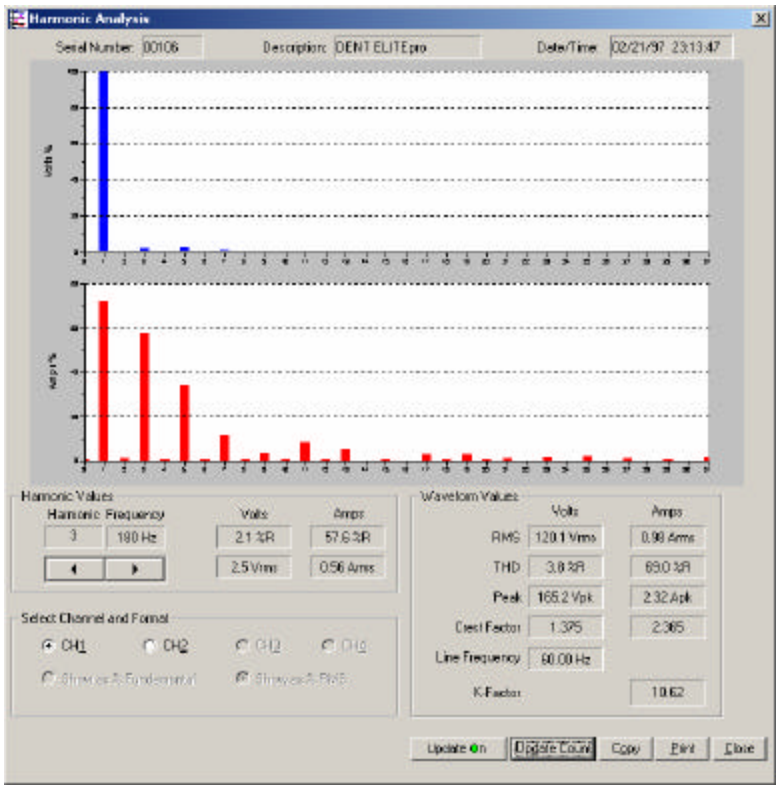


The buttons along the lower left side of the window select the Channel to be displayed. Only one channel may be viewed at a time. The image presented is a single snapshot in time. Use the **Update** button for additional views. Copy will capture the image onto the clipboard for pasting into other programs.

> ***Note:*** *The waveform image displayed shows a highly distorted (current) waveform from a computer power supply. These waveforms are typical for switching power supplies and are a major cause of line harmonics. See also the graph on the next page.*

Viewing Harmonics {ELITE*pro* only}

Use the software command **Logger**; **Display Present Readings; Harmonics** to see the actual current, voltage and power waveform. A typical (highly distorted) display is shown below:



The buttons along the lower left side of the window select the Channel to be displayed. Only one channel may be viewed at a time. This screen includes a good deal of information. The voltage and current harmonics are presented graphically in the upper part of the window. The ordinate (y-axis) is scaled in percent of the fundamental. The abscissa (x-axis) is the harmonic. Both even and odd harmonics are shown.

The actual value of the voltage and current for each harmonic may be found in the Harmonic Values box. By clicking on the buttons, higher or lower order harmonics may be selected. The Waveform Values box provides summary statistics for the overall current and voltage waveforms. This includes the RMS value, Total Harmonic Distortion (THD), Peak values, Crest Factor and K-Factor.

Note: *The individual harmonic values and THD can be shown as a percentage of the fundamental (IEEE Standard 1035-1989) or as a percentage of the total RMS value (CSA and IEC standard).*

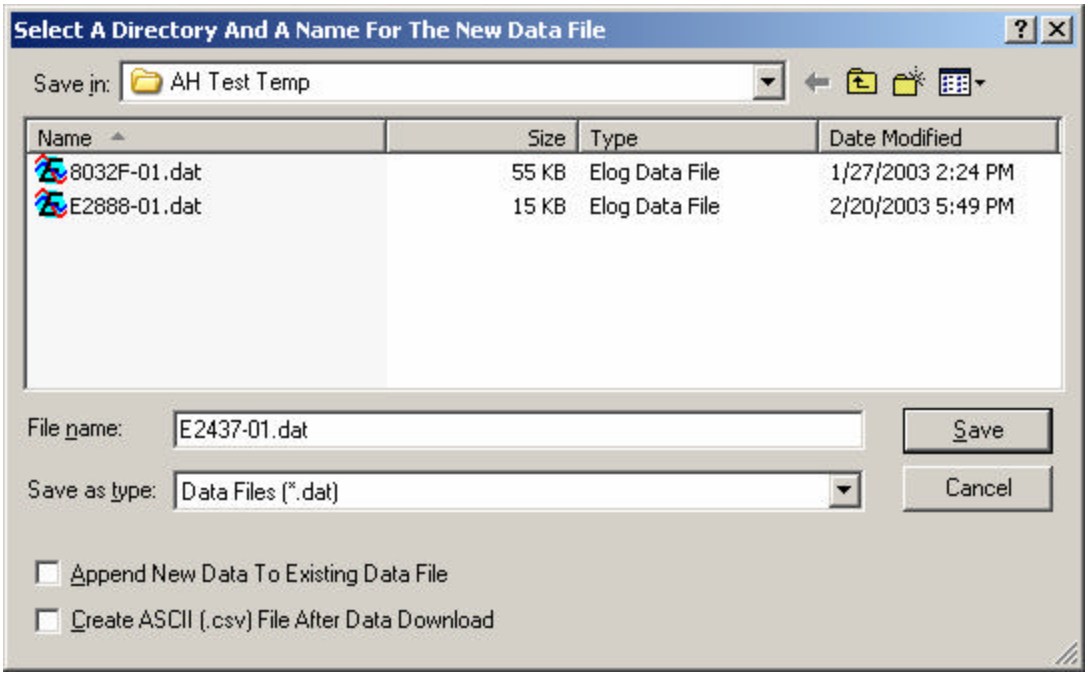
The image presented is a single waveform snapshot. Use the **Update** button for additional views. **Copy** will capture the image on the clipboard for pasting into other programs.

TECH TIP: *The default number of harmonics shown is 31 plus the DC component. To view additional harmonics (up to the 63rd) place the cursor on the horizontal axis of either (or both) the voltage or current bar graph then double click. In the Horizontal Axis dialog box, change the "**To**" field to the number of the highest harmonic desired then click **OK**.*

Step 5: Retrieving Data From The Logger

After connecting the logger and a PC, the data in the logger can be retrieved by using the **Logger; Retrieve Data** command.

This command retrieves data from the logger and saves it as a binary file with a .dat extension on the file name on the computer hard disk. Before retrieving the data, you will be prompted for a data file name as shown below. The default will be the Logger serial number plus 2 digits that correspond to the number of times data has been retrieved from the Logger and stored in the target folder on the PC. The data will be saved to the folder as specified in **Tools; PC Setup; Data Files Saved To:** or as specified when the data is retrieved. The default data folder is C:\Program Files\DENT\ELOG\Data



Note the two additional check boxes at the lower left of the screen. The **Append New Data To Existing Data File** box, when checked, then anytime a logger is read and the data retrieved, it will be appended to a previously existing data file from that logger. You will need to select which data file to append to. Data will only be appended to a data file if the setup table of the logger has not been changed from when the earlier data file was downloaded. The "Append" feature is very useful for long term metering projects where automatic, periodic data downloads are made.

Create ASCII (.csv) File After Data Download, if checked, will automatically create a second file in addition to the .dat file that is in a comma separated variable (.csv) format. A .csv file can then be opened in a variety of third party programs such as Microsoft Excel.

To view a data file, use **Data; Open Data File** and then choose the file desired.

> ***TECH TIP: When retrieving data from a Logger that is connected to external DC power, the sampling rate is reduced from one read every three seconds to one read every 15 seconds during the data retrieval. For Loggers that are operating on the internal battery the sampling rate remains at once per minute.***

Step 6: Viewing the Data; Analyzing, Graphing And Exporting

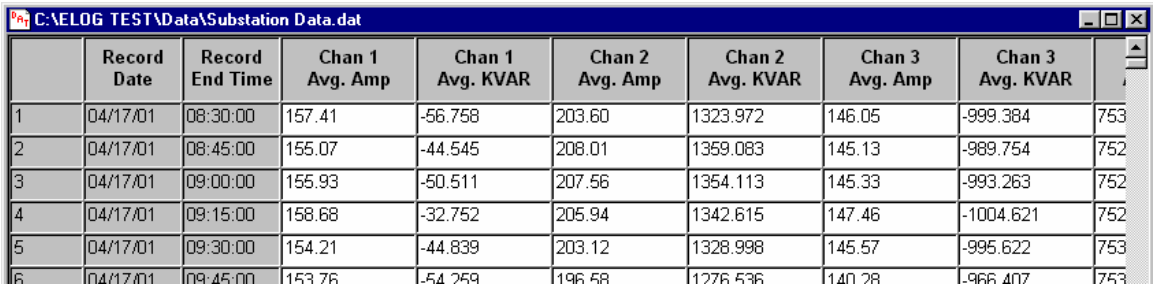
Once the data stored in the Logger has been retrieved to a PC, there are three options available:

1. The data may be opened and viewed (but not edited) using **Data; Open Data File** and then choose the file desired (or also, **File; Open**; select **Data File; Ok)**.
2. You may create graphs using **Data; Create New Graph…** and perform various analysis functions Using **Data; Analyze a Selected Data Range** or create a quick summary of the data using **Data; Data File Summary**. The data file can also be clipped using the **Extract a Range of Data**
3. The data can be **Exported** as a comma separated variable file (.CSV) for viewing or further analysis in other applications such as spreadsheets.

Additional analysis and graphing features are continuously being added to ELOG. Consult with DENT Instruments for availability.

VIEWING A DATA FILE

Stored data files can be viewed (but not edited, editing must be done in another application) by selecting **Data; Open Data File**. To view a data file it must first be downloaded from the Logger by using the **Logger; Retrieve Data...** command. After selecting a data file, a screen similar to the one below will appear:


C:\ELOG TEST\Data\Substation Data.dat

	Record Date	Record End Time	Chan 1 Avg. Amp	Chan 1 Avg. KVAR	Chan 2 Avg. Amp	Chan 2 Avg. KVAR	Chan 3 Avg. Amp	Chan 3 Avg. KVAR	
1	04/17/01	08:30:00	157.41	-56.758	203.60	1323.972	146.05	-999.384	753
2	04/17/01	08:45:00	155.07	-44.545	208.01	1359.083	145.13	-989.754	752
3	04/17/01	09:00:00	155.93	-50.511	207.56	1354.113	145.33	-993.263	752
4	04/17/01	09:15:00	158.68	-32.752	205.94	1342.615	147.46	-1004.621	752
5	04/17/01	09:30:00	154.21	-44.839	203.12	1328.998	145.57	-995.622	753
6	04/17/01	09:45:00	153.76	-54.259	196.58	1276.536	140.28	-966.407	753

The data is always shown in the same way. The left-most column is the record number. It begins with 1 and continues sequentially through all of the data records in the file. The second column is the date of the record and the third column is the time of the record.

TECH TIP: *To change the format for the date and time stamps use Start, Settings, Control Panel, Regional Settings (Win 95, 98, 2000) or Regional and Language Options (Win XP).*

NOTE: *To view all the data when it does not fit on one screen, use the up/down, left/right scroll bars to move through the data.*

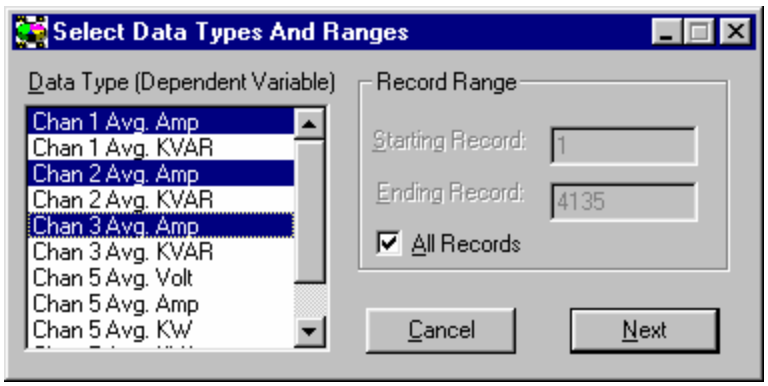
The fourth and remaining columns are the data recorded for each parameter that had been logged. If minimum or maximum values were recorded, then the time (to the second) that the minimum or maximum occurred will also be recorded.

GRAPHING AND ANALYZING THE DATA

Use *Data; Create New Graph…* to make a graph from a saved (on the PC) data file.

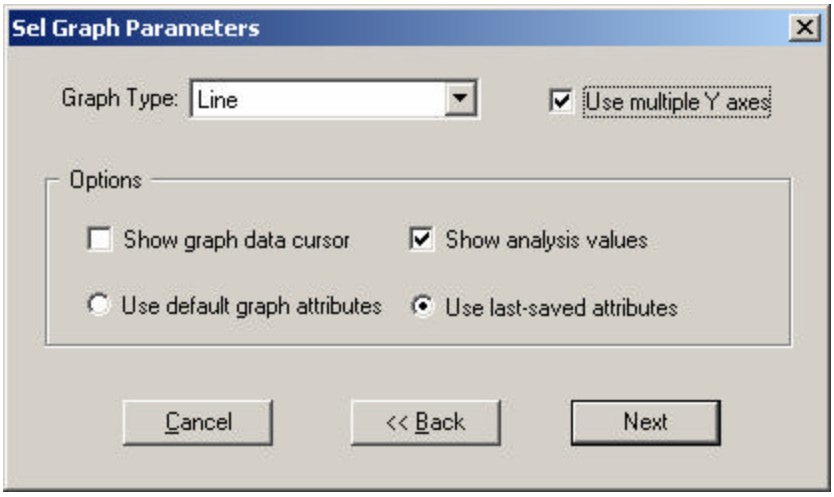
If a data file is not already open, clicking on this menu item will first bring up a folder from which to select a data file to be used as a source to create a graph. If a data file is already open, selecting this menu item will again open the file folder but will default to the file that is already open.

After selecting a data file, a screen similar to the example below will appear:

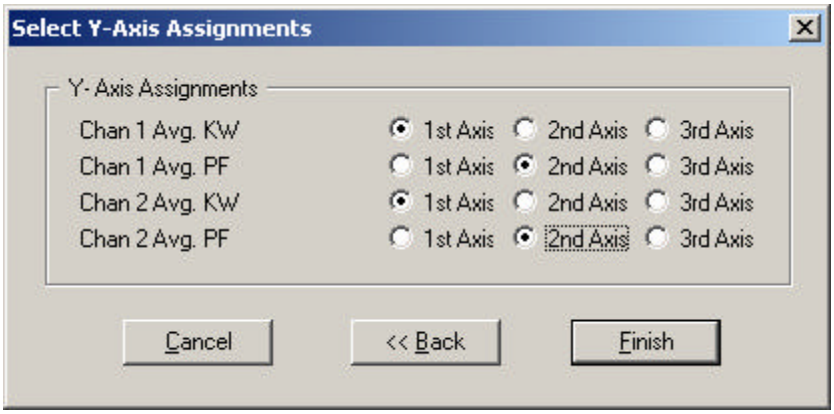


Use the mouse to select which parameters you wish to graph. Use standard Microsoft Windows functions to select parameters such as: Tag multiple parameters simultaneously by clicking on the first one and then hold down the Control (Ctrl) key and click on any other desired parameters; to select a continuous group of parameters, click on the first one and then hold down the Shift key and click on the last parameter in the group. This will select all parameters within the group including the first and last ones.

After selecting the parameters to graph, click **Next** to define the type of graph to make. Click on the down arrow to reveal the graph type options. Click the data cursor check box to have the data cursor appear when the graph is created (you can also toggle the data cursor on and off with the right mouse button). Use the radio buttons to choose between using the default graph parameters (colors, fonts, etc.) and those used in the last graph created. You can also choose to show summary statistics (minimum, maximum, average) on the graph by checking the Show analysis values box.

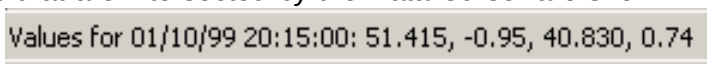


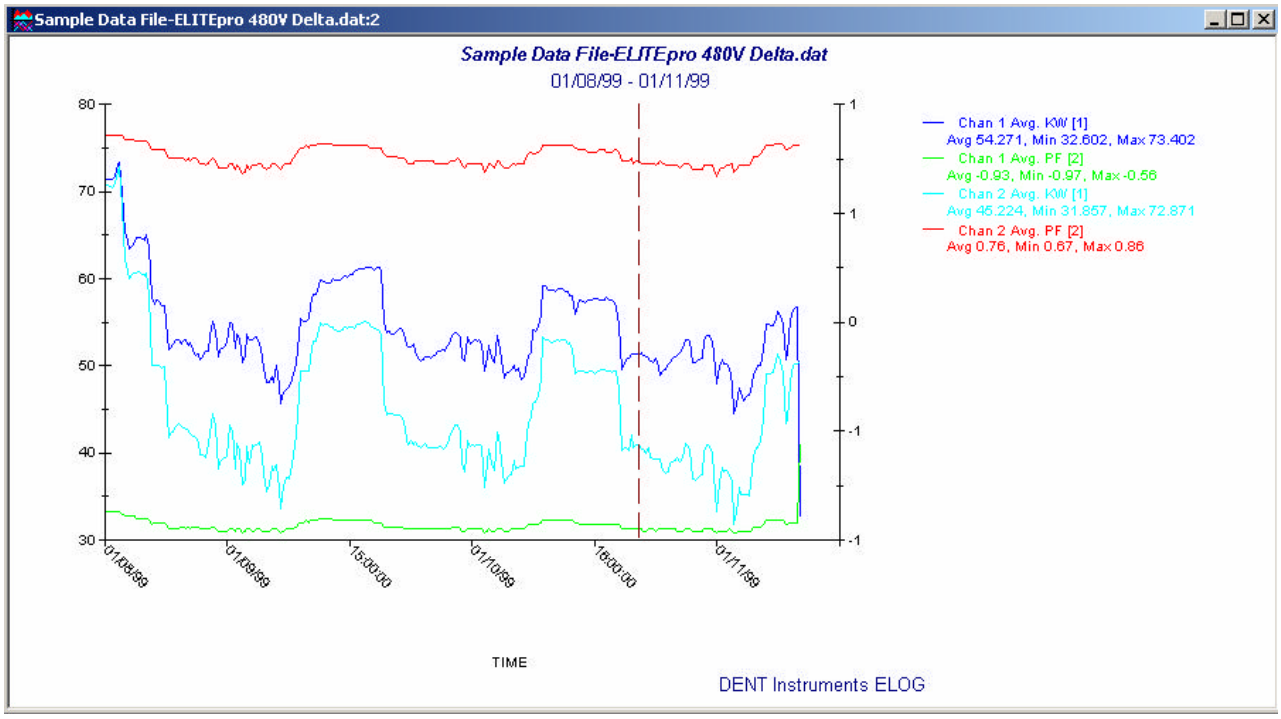
If you have selected more than one parameter to plot the Use multiple Y axes box will appear. If checked, you will get a third window that allows you to assign which parameters are assigned to which Y axes.



Click **Finish** and the graph you have defined will appear similar to the example shown below. Though difficult to see, the parameter names to the right of the graph have a number (1, 2, or 3) in parentheses that indicates which Y – axis they are referenced to. Notice the vertical dashed red line data cursor.

The graph values that are intersected by the Data Cursor are shown in the lower left hand corner of the screen.

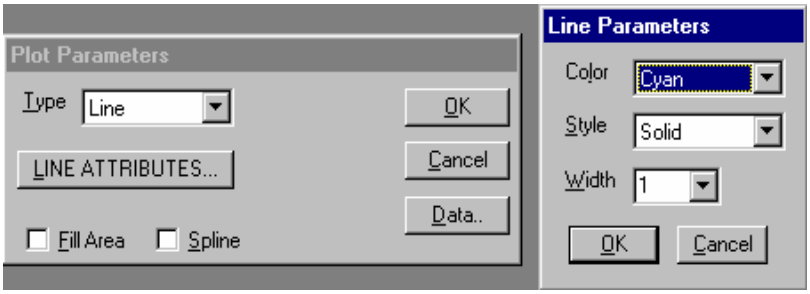



Sample Data File-ELITEpro 480V Delta.dat:2
Sample Data File-ELITEpro 480V Delta.dat
01/08/99 - 01/11/99
Chan 1 Avg. KW [1]
Avg 54.271, Min 32.602, Max 73.402
Chan 1 Avg. PF [2]
Avg -0.93, Min -0.97, Max -0.56
Chan 2 Avg. KW [1]
Avg 46.224, Min 31.857, Max 72.871
Chan 2 Avg. PF [2]
Avg 0.76, Min 0.67, Max 0.86
TIME
DENT Instruments ELOG

TECH TIP: *Quickly create a graph from an open data file by clicking on the* ***Create Graph*** *hot button.*

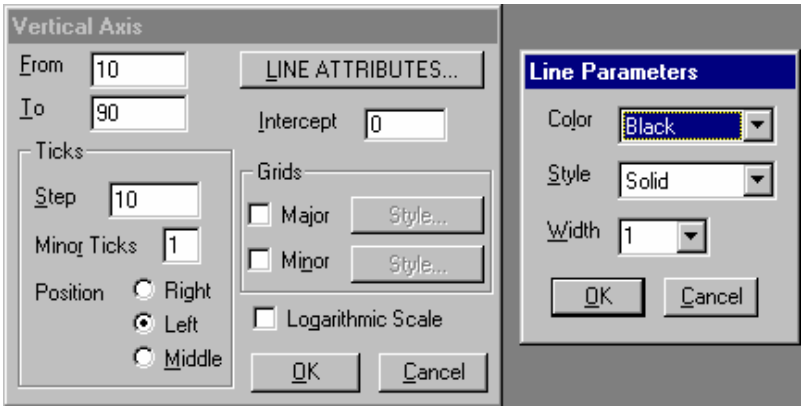
Once created, the graph may be edited in a number of ways. In general, any editable feature may be changed by double-clicking on the feature and making changes in the dialog box that appears. A few examples follow:

By double-clicking on a data point of one of the variables that are in the graph, the following screen appears from which the graph type, color and other parameters may be changed:



NOTE: *The Line Parameters box is found by clicking on the box Line Attributes...*

Double-clicking on the vertical axis produces the dialog box below that can be used to change scale, add grid lines and tick marks.



Double clicking on the axes text (near the axis) will allow you to change the font and size of the labels.

TECH TIP: Zoom *To zoom in on any portion of the graph, position the mouse pointer near the area to be enlarged. Hold the Control (Ctrl) key and left mouse button down together then drag the pointer to make a rectangle that covers the area to be zoomed. Let go of the mouse and Control key and the graph will redraw an enlarged portion of the graph.*

The graph may be zoomed as many times as desired. Use the ***View; UnZoom****, Ctrl U, or the* *hot button to unzoom in reverse order of the zoom.*

Graphs as well as other file types (Data, Setup Tables, Logger Lists) may be printed using the **File; Print…** command (or Ctrl + P).

ELOG now incorporates a number of data analysis features. Use the menu command:

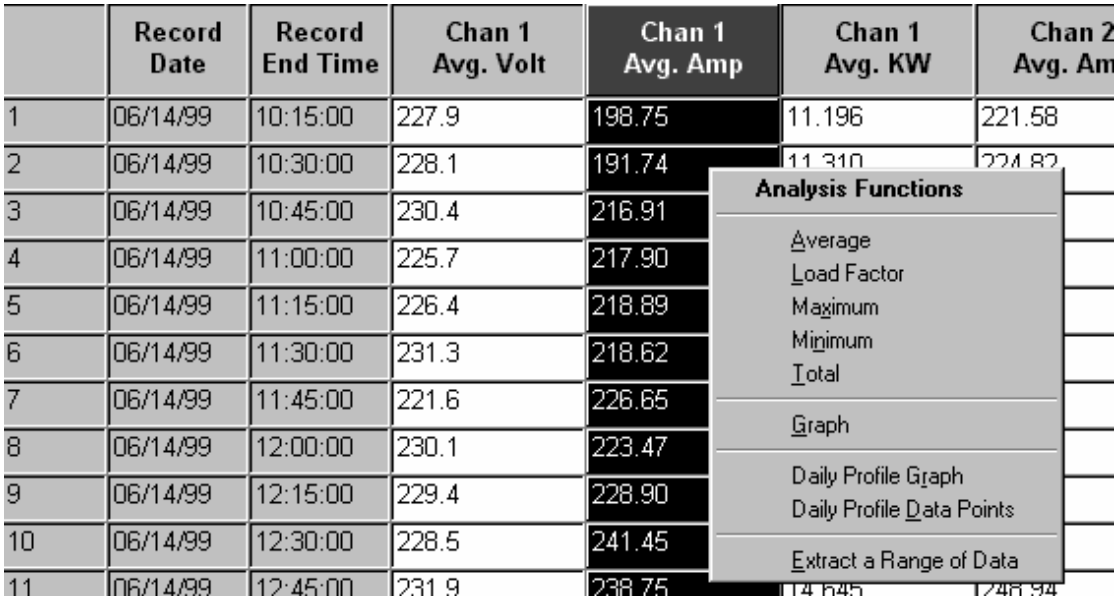
TECH TIP: Data Value *To determine the actual value (X and Y coordinates) of any data point in a graph, place the mouse pointer over the point in question and push the right mouse button. The X (time) and Y (value) of the point will be shown in the lower left corner of the screen.*

Analyze A Selected Data Range to access all the features. To use this command, first select a range of data in the file. Do this by placing the mouse over the first record to be included in the analysis and, with the left mouse button held down, drag the pointer to the end of the range of data desired. To select an entire column, place the mouse pointer over the column header (title) and left click.

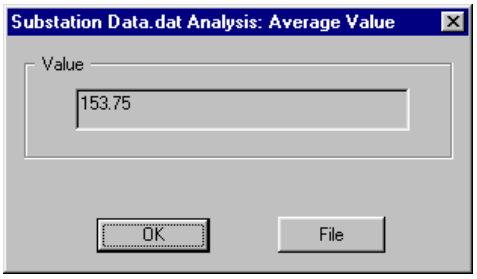
There are two things to be aware of: a selection must include at least two records in the same column and only one column may be selected at a time.

Once the data records of interest have been selected (highlighted) use the **Data; Analyze a Selected Data Range** command to choose the desired analysis function.

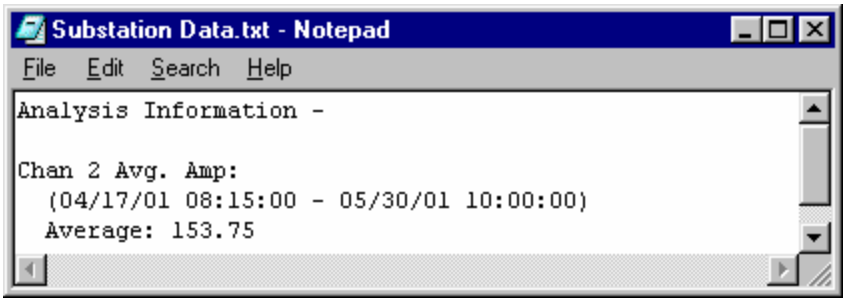
A faster way is to simply use the mouse to select a column or range of data to analyze and then right click the mouse while the pointer is over the highlighted section.



Selecting Average, Load Factor, Maximum, Minimum or Total brings up a display such as:



Selecting OK closes the pop-up window and returns you to the data file. Selecting File opens the Microsoft Notepad and creates a file such as the one below.

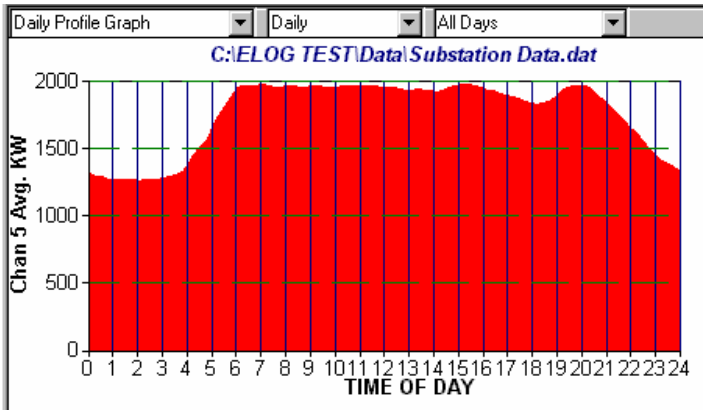


From this point the Notepad file may be edited, saved or printed. In addition, if further analysis is done on this data and the "File" selection is made, the new analysis is also added the current Notepad document.

Load Factor is the ratio of the peak (maximum) value to the average value. A horizontal line would have a load factor of 1.0.

Graph creates a line graph of the selected data range.

Daily Profile Graph and **Daily Profile Data Points** are two powerful new functions that create a 24 hour or 7 day profile graph (sometimes called Load Profile) of the data. A daily profile graph always has as the X-axis the time of day from 0-24 hours or 0-7 days. The Y-axis is the average value at each hour of the day. Think of it as taking all the days of data laid one on top of the other to create an average day. The X-axis resolution of the DP graph and data points is the same as the integration interval of the original data.



Starting	Ending	Chan 5 Avg. KW
12:00:00 AM	12:14:59 AM	1309.144
12:15:00 AM	12:29:59 AM	1294.156
12:30:00 AM	12:44:59 AM	1286.723
12:45:00 AM	12:59:59 AM	1272.086
1:00:00 AM	1:14:59 AM	1262.168
1:15:00 AM	1:29:59 AM	1266.999
1:30:00 AM	1:44:59 AM	1264.248
1:45:00 AM	1:59:59 AM	1261.210
2:00:00 AM	2:14:59 AM	1253.972
2:15:00 AM	2:29:59 AM	1261.502
2:30:00 AM	2:44:59 AM	1263.407
2:45:00 AM	2:59:59 AM	1262.420
3:00:00 AM	3:14:59 AM	1277.095

An example Daily Profile Graph and Data Points are shown here.

Within the Daily Profile graph there are a number of other functions available including changing to an average Weekly Profile and several choices in the day types used in the graph: All Days, Week Days Only, Weekend Days Only.

Both the DP graph and data points may be saved using the File; Save As command. The graph becomes a Windows meta file (.wmf) and the data points are saved as a comma separated variable (.csv) ASCII file.

Data File Summary is a new feature that provides a quick summary of the data and the data file. The Data File Summary opens Notepad and creates a new file that provides a quick snapshot of the data file, the measured parameters, the setup table and the logger itself. This is where the Peak kW Demand and kWh, kVARh, and kVAh totalizer values are found. This document may be edited or saved with Notepad or copy and pasted into a word processor such as MS Word.

```
Data Summary
------------
Data File Name: 00000-01.dat

First Data Record End Time: 02/02/04 12:55:15
Last Data Record End Time: 02/02/04 12:58:30
Monitoring Period Duration: 0.00 days

Peak Demand: 277.002kW on Monday 02/02/04 at 12:55:00

Total Usage (Channel 5): 11kWh, 15kVAh, 0kVARh
Total Usage (Channel 6): 0kWh

                Average   Maximum (Date Time)          Minimum (Date Time)          Total
--------------------    -------------------------   -------------------------   --------
Chan 1 Avg. KW  112.373  151.521 (02/02/04 12:55:30)  98.160 (02/02/04 12:58:15)  1573.228
Chan 1 Avg. PF  0.75     0.76 (02/02/04 12:58:15)     0.73 (02/02/04 12:55:30)    10.52
Chan 2 Avg. KW  113.959  153.113 (02/02/04 12:55:15)  99.800 (02/02/04 12:56:30)  1595.427
Chan 2 Avg. PF  0.75     0.77 (02/02/04 12:57:45)     0.73 (02/02/04 12:55:30)    10.53
Chan 5 KW Hours 0.943    1.269 (02/02/04 12:55:30)    0.825 (02/02/04 12:58:15)   13.204
Chan 5 Avg. KVA 301.104  416.661 (02/02/04 12:55:30)  259.440 (02/02/04 12:58:15) 4215.459
Chan 5 KVAR Hours 0.068  0.075 (02/02/04 12:56:45)    0.053 (02/02/04 12:55:30)   0.958

Setup Summary
-------------
Setup Table Description:

Channel 1 - Power: VHi: L1, VLo: N; PT = 100.000; CT = 150.000
Channel 2 - Power: VHi: L1, VLo: N; PT = 100.000; CT = 100.000
Channel 5 - Power Sum: 1,2

Memory Type: Ring
Line Frequency: 60 Hz
Integration Period: 15 Seconds

Channel 5 Peak kW Demand Window: Moving, Width = 1 minutes

Logger Summary
--------------
Logger Description Line: DENT ELITEpro Logger
Logger Serial Number: 00000
Logger type: ELITEpro
Firmware Version: IL400.057
```

Extract a Range of Data is used to trim undesired data off of the ends of the data file. Sometimes data collection occurs before the logger is connected to the load and produces “0” for the first few data records. This can also occur at the end of the data file. By using the Extract command, the ends of the data can be removed.

This feature can also be used to select a set of data out of the middle of a larger data set. For example, perhaps there is a data file that spans the months of April through June but it is desired to have only May data. The Extract command can be used to obtain only the May data.

EXPORTING A DATA FILE FOR USE IN ANOTHER PROGRAM

Data files may also be exported in an ASCII format for further analysis in other programs. The menu command Data; Export Data File… converts the raw, binary .DAT file to a .CSV format (comma separated variable) which can be brought into a spreadsheet or database program.

To view the data from a spreadsheet program such as Excel follow these steps:

1. Use Data; Export Data File… Then select the desired data file to export
2. Click on Open; a new file with the same name but .csv instead of .dat will be created

or

1. Retrieve the data from the Logger or open an existing file
2. Use File; Save As and under Save as type select Comma Separated Files and then Save

then

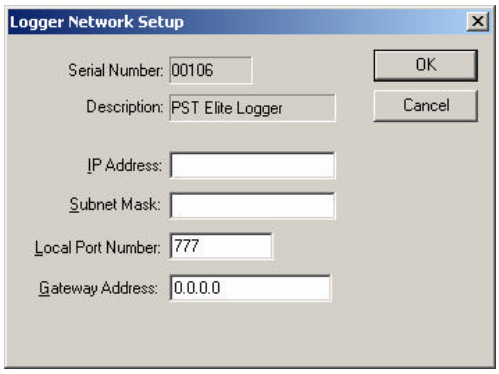
3. Start the spreadsheet program
4. From the spreadsheet, use File; Open and find the .CSV data file from the folder you specified, for example, C:\Program Files\DENT\ELOG\Data*name of file.csv*
5. Follow the instructions for importing the file.

Communication Via Local Area Network (Ethernet)

When equipped with the on-board Ethernet card, the ELITEpro and DATApro Loggers can be accessed remotely over a network by any PC on the network running ELOG. This includes accessing the loggers over the internet from anywhere in the world. Networked loggers can also have their data read automatically by using AutoPoll described below and near the end of section 2.

To use the network connection the logger must first be configured for such use. This must be done through a direct (serial) connection before putting the logger on the network. You will need to obtain an unused Static IP Address, Local Port Number, and Subnet Mask Number from your network administrator. A familiar analogy is to think of these items as the "country code, area code, and telephone number" of the logger on the network. The network administrator acts much like the local telephone company who assigns the telephone number to a new home.

Using the direct serial connection, connect to the logger and click Logger; Communication; Logger Network Setup… menu command to bring up the following screen:

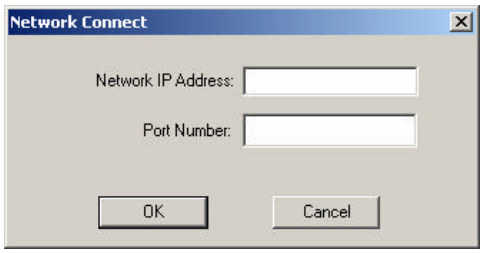


Input the appropriate IP Address, Subnet Mask and Local Port Number obtained from the network administrator. The Gateway Address is usually not needed but is used with large networks that have routers.

After entering the addresses click on OK to send them to the logger. Disconnect from the logger by clicking the button. Unplug the serial cable from the logger and using a standard Ethernet cable, plug the logger into any open Ethernet jack that has the same Subnet Mask address as in the logger.

> ***NOTE:*** *The logger must have external power from the wall transformer to operate the Ethernet card.*

Next click on the Network Connection button in ELOG. A screen similar to the one at right will appear. Enter the IP Address and Port Number for the logger and then click OK. ELOG should then connect to the logger.



Using a Logger List: If there are multiple loggers on the network it is often easier to use a Logger List to keep track of them and their addresses. A Logger List is like an "address book" of your loggers. To create a logger list use File; New; Logger List File; OK. A screen similar to the one below will appear. Click the Setup button to enter logger connection type (direct, network, modem) and the logger's address.

Use Add Logger to create new, blank entries in the Logger List and then complete the addresses as with the first one. When finished, use the File; Save (or Save As…) command to save the Logger List to the hard disk on your computer.

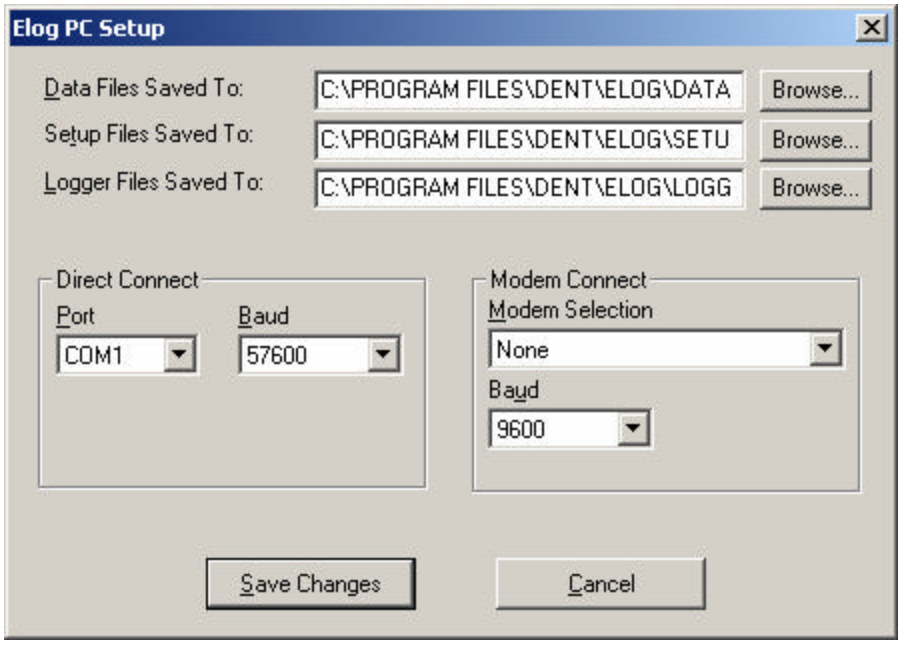
To use a Logger List to connect to a logger, use the File; Open: Logger List File command and select the Logger List containing the logger you wish to contact. Using the Serial Number and/or Description line to identify the desired logger, click Connect. Additional information about Logger Lists can be found in Section 2 under AutoPoll.

Communication Via Telephone Modem

When equipped with a modem, the ELITEpro and DATApro Loggers can be accessed remotely over land telephone lines or through a cellular telephone network. All of the functions that are available during a direct serial connection to a PC are also available over modem connections. This section describes telephone communication using an internal modem. For a discussion of using external modems, see USING ELITES WITH EXTERNAL MODEMS in the Application Notes.

Loggers with modems can also have their data read automatically by using *AutoPoll* (PC initiates the call) or *AutoHost* (logger initiates the call) described below and in Section 2.

Before beginning a telephone connection, the PC and PC modem should be properly configured. Use the Tools; PC Setup… menu command to enter the PC setup screen as shown below:



In the Modem Connect window, select the PC modem that you want ELOG to use to call (or answer) the loggers. If there are multiple modems in the PC, choose the one desired. If there is only one modem, you may select that modem or **None** and ELOG will find the modem when making a call.

> ***TECH TIP:*** *Quickly set up the PC by clicking on the* *PC Setup button on the screen.*

Next select the desired communication speed (baud rate). If using a logger with an internal modem, set the PC modem baud rate to match that of the logger modem. Currently the default choice is 9600 baud but the logger modems can be set 1200 or 2400, 4800, 9600, 14400.

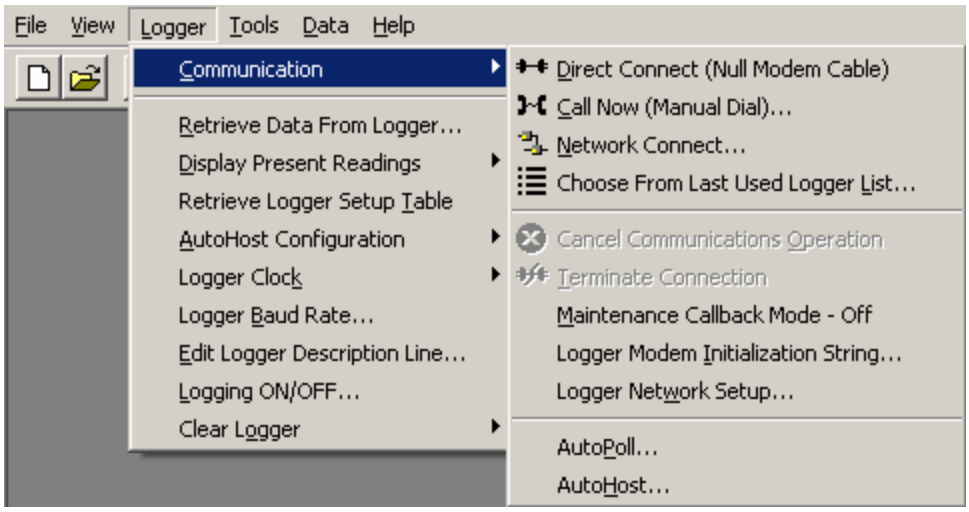
> ***NOTE:*** *The PC modem must match the logger modem baud rate for a connection to occur. Set the logger modem baud rate from a direct serial connection by selecting Logger; Logger Baud Rate…*

Changing The PC Modem Initialization String: ELOG uses the Windows 95 (and higher) TAPI protocols that lets the user select only which modem and baud rate to use. To change the computer modem Initialization string, use the Windows Start; Settings; Control Panel; Modems; General tab; Properties button; Connection tab; Advanced button; Extra Settings line. Consult your modem manual for the specific commands.

Changing the Logger Modem Initialization String: The logger modem can also be configured. It is done through the *Logger; Communication; Logger Modem Initialization String…* menu in ELOG. The initialization string is stored in the logger and is sent to the modem every day at midnight and at midday as determined by the logger clock. The resending of the initialization string helps prevent modem lock-ups by continually resetting the modem.

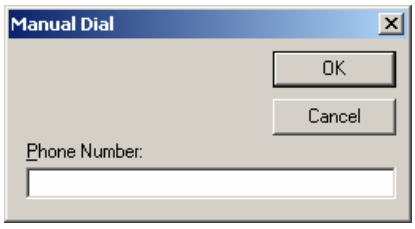
CALLING THE LOGGER FROM THE PC

Use the Logger; Communication menu to access the telephone connection options.



From the Logger; Communication menu, use either Call Now (Manual Dial)… or Call Now (Choose From Logger List)…

Call Now (Manual Dial)... brings up the following window in which the telephone number to be called is to be entered. Simply enter the telephone number to be called and press **OK**. The PC will then be directed to call the logger and initiate a communication session.



Using a Logger List: If there are multiple modem equipped loggers to be called it is often easier to use a Logger List to keep track of them and their telephone numbers. A Logger List is like an "address book" of your loggers. To create a logger list use File; New; Logger List File; OK. A screen similar to the one below will appear. Click the Setup button to enter logger connection type (direct, network, modem) and the logger's phone number.

Use Add Logger to create new, blank entries in the Logger List and then

complete the telephone numbers as with the first one. When finished, use the File; Save (or Save As…) command to save the Logger List to the hard disk on your computer.

To use a Logger List to connect to a logger, use the File; Open: Logger List File command and select the Logger List containing the logger you wish to contact. Using the Serial Number and/or Description line to identify the desired logger, click Connect. Additional information about Logger Lists can be found in Section 2.

AUTOMATIC DATA COLLECTION

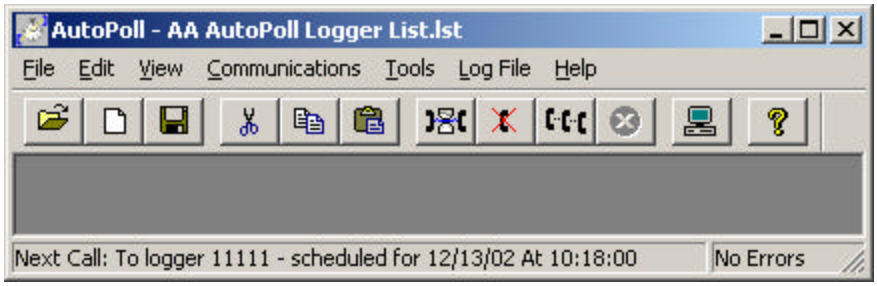
The logger and computer can also be set up to automatically and routinely download data. There are two options: The first is where the logger calls the PC (AutoHost) and the second is where the PC calls the logger (AutoPoll).

1. PC INITIATED CALLS TO THE LOGGER (AUTOPOLL)

ELOG may be used for unattended and automatic data retrieval from a number of remote or networked loggers. AutoPoll (short for *Auto*matic *Poll*ing) is a stand-alone program that may be launched from ELOG by using the *Logger; Communication; AutoPoll…* menu command. AutoPoll works in conjunction with a *Logger List*, which is a compilation of one or more local, networked, or remote loggers, how they are contacted (serial port, IP address or modem telephone number), call schedules and other tasks. A complete description of Logger Lists is found below.

Additional information, including detailed explanations of Logger Lists, can be found in Section 2: ELOG Menu Commands; AutoPoll: Unattended Calling From The PC To The Logger.

After launching AutoPoll, you are prompted to first select a Logger List containing the loggers that you wish to call. *Only one Logger List may be active at a time*. After selecting the desired Logger List, a screen similar to the one below becomes the active window.


AutoPoll - AA AutoPoll Logger List.lst
File Edit View Communications Tools Log File Help
Next Call: To logger 11111 - scheduled for 12/13/02 At 10:18:00
No Errors

At this point, the AutoPoll program is running and may be minimized if desired. The AutoPoll File command can be used to open and change the active Logger List. Note that in the bottom of the window is a status bar showing the next call that AutoPoll will make.

> ***Note:*** *AutoPoll can also be used for multiple, automatic data downloads while on a direct serial connection or over an Ethernet LAN or even over the Internet. See the section Menu Commands; AutoPoll: Unattended Calling From The PC To The Logger for more information.*

2. LOGGER INITIATED CALLS TO A PC (AUTOHOST)

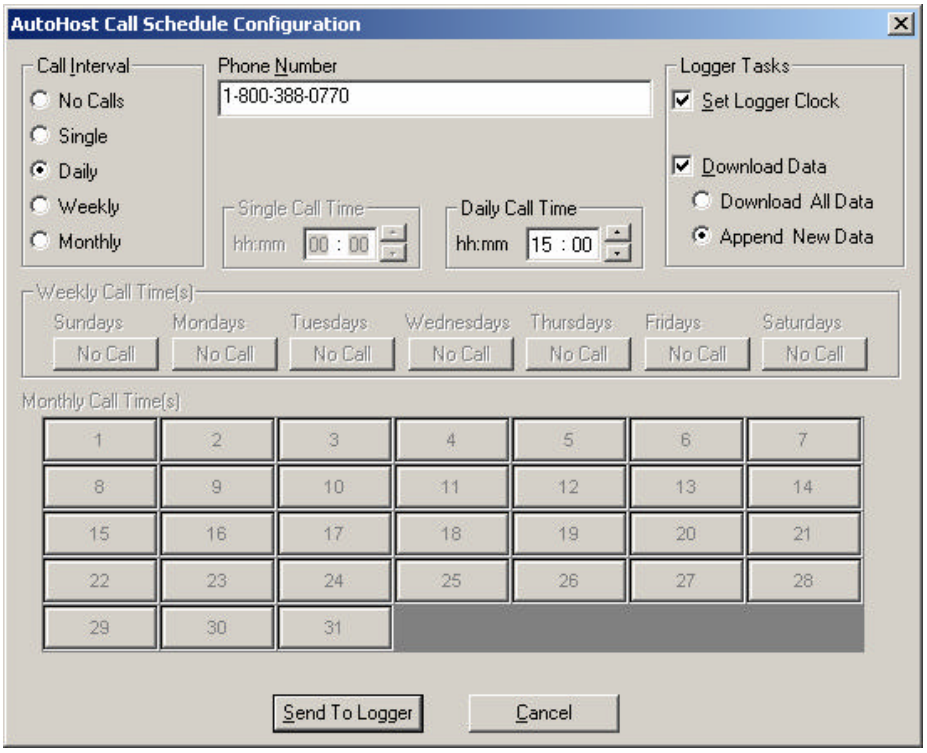
ELITE*pro* and DATA*pro* loggers can also be configured to initiate telephone data retrieval sessions. The AutoHost configuration is stored in the logger and contains a call-out schedule, task list and telephone number. At the time(s) specified in the AutoHost schedule stored in the logger, the logger will call a host computer at the telephone number in its memory. If the computer has the application AutoHost running (AutoHost is launched from the menu Logger; Communication; AutoHost), then the computer will answer the call and perform the data retrieval tasks programmed into the logger.

Whereas AutoPoll described earlier can be used with loggers on a direct connection, network connection or telephone connection, AutoHost can only be used on a telephone connection. AutoHost is most useful for situations where a remote logger must share a telephone line with a customer.

Additional information can be found in Section 2: ELOG Menu Commands; AutoHost: Unattended, Logger Initiated Calls To The PC.

To use AutoHost, connect a logger to the serial port of a PC using the *Logger; Communication; Direct Connect* command. Then use *AutoHost Configuration; Store* (or *Retrieve*) to call up a configuration table to edit. Using *Retrieve* will call up the AutoHost configuration already in the logger. Using *Store* will call up a blank configuration if *Retrieve* has not already been used. If *Retrieve* has been used, then the AutoHost configuration shown will be the one previously brought from the logger.

An example configuration table is shown below. The call interval has been set to Weekly and the logger makes calls to a host computer at the number 1-800-388-0770. According to this example schedule, the logger will call *every* Monday at 03:00, Wednesday at 05:30 and every Friday at 02:00. Upon connection with the AutoHost program, the host computer is instructed to update the logger clock to the PC clock and download ALL data in the logger.



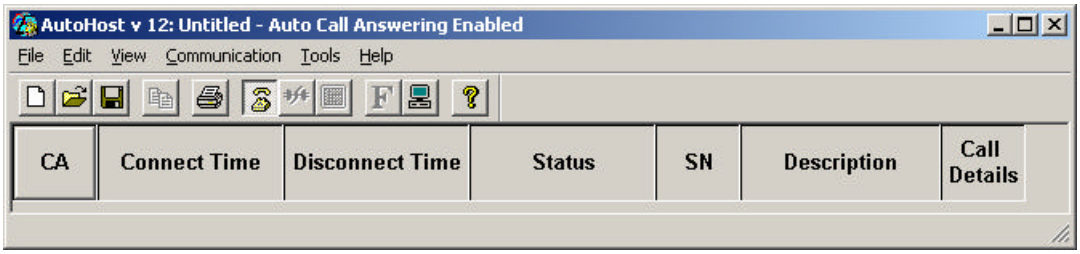
Note: You must be connected to a logger to use the AutoHost Configuration command.

With an AutoHost configuration on the screen, change the configuration table as desired. Use the **Store** key to send the changed table back to the logger. The configuration table must have set, as a minimum, the telephone number of the host computer to call, a call time, and a task (set clock and/or download data).

There are two data download options. The first, **Download All Data**, sends all the data stored in the logger to the PC. The second option, **Append New Data**, sends only the data that the logger has collected *since the last time the logger was read* by the host computer. In this instance, the new data (since last download) is appended to the existing data file that has already been retrieved from the logger. If the logger cannot find an existing data file to append to, it will default to a complete data download.

The default Call Interval is No Calls. The logger can be set to make only one call to the host (**Single**) or every day (**Daily**). To call on a monthly basis choose **Monthly** in the Call Interval box. At that point, the **Monthly Call Time(s)** window becomes active and a call time for a day(s) of the month is selected by using the mouse to click on the day(s) that a call is to be made. A window similar to the one below appears:

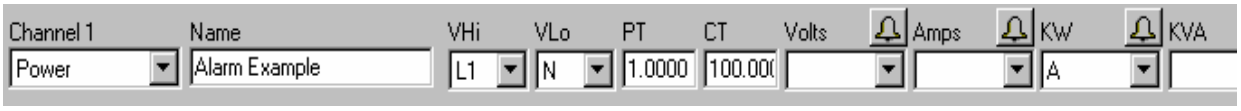
Lastly, use *Logger; Communication; AutoHost…* to launch the AutoHost program. The AutoHost program must be running for the computer to answer calls from the loggers.



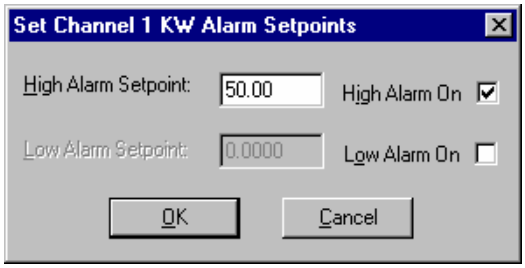
ALARMS

The **ELITE***pro* and **DATA***pro* have the capability to accept high and low alarm set points for any of the measurement parameters (V, A, kW, kVAR, kVA, and Power Factor, temperature, milliamps an so on). When a channel exceeds either its high or low level set point it will call a programmed telephone number and download the data to the AutoHost program.

To set an alarm, use the second page of the Setup Table as shown.



Click on the bell symbol or the parameter that you wish to have the alarm set, for example, KW.



A dialog box similar to the one above will appear. By checking either or both the High and Low Alarm On boxes you can enter the set points for which you want an alarm call to occur. The units of the trigger point are always the same as the parameter being tested. For example, in an **ELITE***pro*, the set point units of a kW channel are kilowatts, the units of a current channel are amps, and so on. For an **DATA***pro*, the set point units are the raw units with the slope and offset (or scale) factors applied. This allows setting alarm points based on engineering units.

Click on **OK**. Note that the recording flag field (where the A,N,X,H flags appear) turns red indicating that an alarm has been set. Use the **Store** command to send the modified setup table into the logger.

When an alarm condition occurs (for example, instantaneous kW exceeds a high level set point) two things will happen. First, when viewing the channel values in real-time using **Logger; Display Present Reading; Show As Text,** the parameter in alarm will turn red.

Second, if the logger is equipped with an internal modem (check with DENT Instruments for applicability of external modems), three minutes after the alarm occurs the logger will call the telephone number in its memory and download all the data in its memory while setting a visual and audible alarm in the host computer. *To answer the call from the logger the PC must have the AutoHost™ program running*.

AutoHost is a stand-alone Windows program that is loaded onto your computer when ELOG is installed. See also the previous section 'Logger Initiated Calls (AutoHost)' for a more detailed explanation.

After making a successful connection to the host PC and completing a download of the data (including the alarm state), AutoHost will reset the logger callout schedule back to what it was prior to the alarm condition occurring. If the measured parameter has not returned to a value within the bounds of the high and low set points, the logger will stay in an alarm state but will not call the host PC again except as dictated by the callout schedule programmed into it's memory.

When the channel reading that was in the alarm state returns to a value that is within the alarm set point boundaries, the logger alarm is reset. The next time an alarm condition occurs, the logger will again call the host PC and download its data and the process is repeated.

When the logger calls the host PC, if it does not make a successful connection and data download, it will retry three more times, two minutes apart. If all four attempts fail, the logger will try again 24 hours later and each day thereafter until a successful connection occurs.

All of the parameters for which an alarm may be set (for example, high voltage, low power factor and so on) are independent. A call will be generated any time any alarm set point is exceeded.

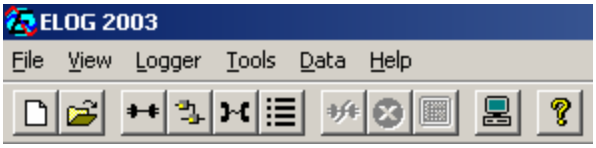
An alarm condition in the logger may also be cleared manually by using ELOG in a direct connection or over the telephone via modem.

ELOG: MENU COMMANDS

This section is a line-by-line description of each menu item in the ELOG software. The order of presentation is from left to right and top to bottom for each command.

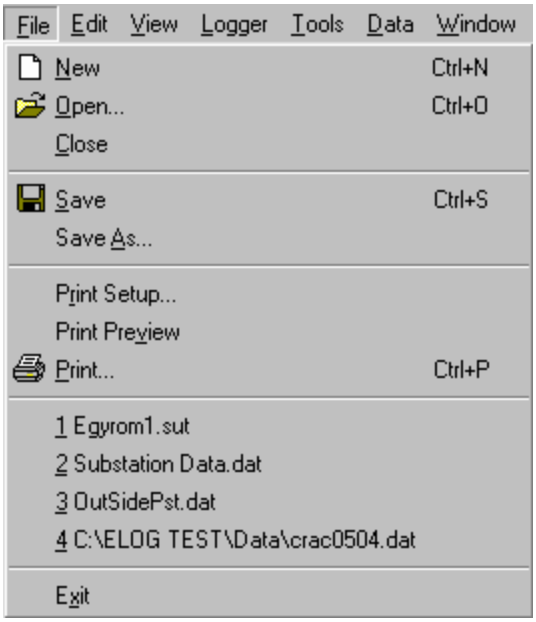
When the ELOG software is first run, the MAIN MENU will appear which consists of one line of standard Windows menus and a lower line of "hot buttons" that can access many of the most commonly used software functions with just one click of the mouse.

MAIN MENU



> ***NOTE:*** *Because MS Windows uses Automatic Menu Switching (i.e., context sensitive), only the commands that are active will appear. When you click on File you will probably see a different list of commands than those shown here.*

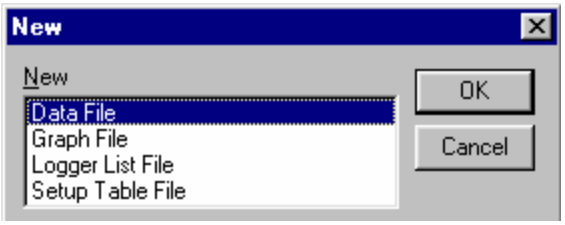
File



Typical Windows commands are found in this menu.

> ***NOTE:*** *For "power users" many of the menu commands can be accessed through shortcut keyboard commands (e.g., Ctrl + N for open an new file) or the speed buttons located on the line below the main menu.*

Opens a New File. There are four kinds of files that are applicable to the data loggers including *Data Files* (data retrieved from a logger), *Graph Files* (graphs made from logger data), *Logger Lists* (groups of loggers used with the AutoPoll, automatic data collection application) and *Setup Table Files* (saved logger configuration settings).



If **Data File** (new) is chosen, the software will ask you to connect to a logger from which the new data file is to be extracted. If already connected to a logger, you will be asked for a file name to give to the data about to be retrieved from the Logger.

If **Graph File** is chosen, a folder window will appear where you may choose from already existing data files which one you wish to use to create a graph.

If **Logger List File** is chosen, you will be shown the folder where the Logger Lists reside and be allowed to select one for review or editing. (Logger Lists are used for unattended data retrieval by the computer; see also the section on AutoPoll.)

If **Setup Table File** is chosen and you are not already connected to a Logger, you will be asked for what kind of Logger (ELite 1, ELite 4, **ELITE***pro*, Energy Logger or **DATA***pro* Logger) you want to create a new Setup Table. If you are already connected to a Logger, it will assume that the Setup Table you are about to create is for the Logger type to which you are connected. (Setup Tables are used by the logger to define which parameters are to be recorded by the logger, how often, and so on.)

The **Open** function is very similar to the **New** command except it assumes that a Data File, Graph, Setup Table or Logger List is already stored somewhere on the computer disk and will prompt you to select which type of file you wish to open. It operates the same whether or not you are connected to a Logger.

This command will close only the currently active file. If multiple files of any type are open, the active file is the one with the illuminated top border.

and

These functions allow you to save an open file of any type using the current name and location (**Save**) or with a new name and/or to a new location on the PC hard disk (**Save As**).

NOTE: *Graphs may also be saved (using* ***Save As****) as a Windows Meta File with a .wmf extension. Because data files may not be edited the* ***Save*** *&* ***Save As*** *commands do not apply and will not appear in the File menu. To change a data file name use Windows Explorer.*

Allows you to define the usual printing parameters such as margins, grid lines, and headers.

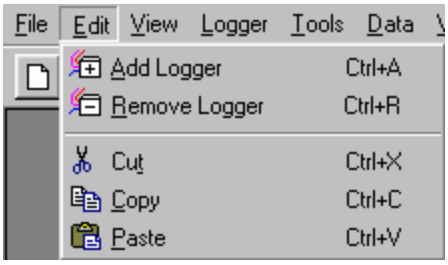
Is used to select the printer to be used, paper tray source, and paper orientation.

Allows you to view the document to be printed as it will appear on the paper.

Is used to initiate printing and select the pages to be printed. Print Setup may also be accessed from this menu.

Exits and closes the **ELOG** program.

Edit

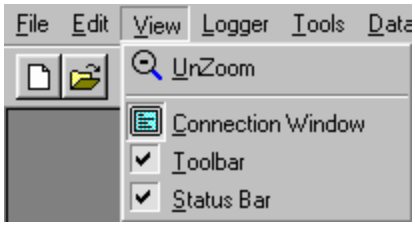


Edit functions include two classes of functions. The first two, **Add Logger** and **Remove Logger,** are used in conjunction with the Logger List to add or remove loggers that are part of the autopolling feature of ELOG. They are described in more detail in the section Logger; Communication; AutoPoll... To use the Add Logger feature, with a Logger List open, simply click on the menu item **Add Logger** or hold the control key (Ctrl) down and the letter A. You may add any number of blank logger lines to the Logger List in this manner by repeating the **Add Logger** (or **Ctrl + A**) command.

To remove a logger from an open Logger List, click on the logger number (left-most column of the list). The entire row describing the logger will be highlighted. Then click on **Remove Logger** or simply hold the Control key (Ctrl) down and type R. You may delete any number of adjacent loggers from a list simultaneously by simply clicking on the row number of the first logger, holding the mouse key down, and dragging the cursor to the last logger to be deleted.

The last three functions **Cut**, **Copy**, and **Paste,** are standard Windows clipboard functions. They allow moving (**Cut**) or copying (**Copy** and **Paste**) text and graphics to other parts of the ELOG program or to other applications such as word processors and spreadsheets.

View

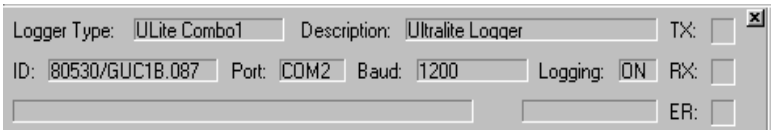


The View functions relate to what is shown on the computer monitor.

UnZoom is only used with graphs to back out of a view where the Zoom function had been used (See also Data; Create New Graph...).

> ***TECH TIP:*** *Quickly UnZoom by clicking on the* *button or typing Ctrl + U.*

The **Connection Window** appears at the bottom of the screen during a connection to a logger and provides information about the logger, communication port, baud rates, etc.

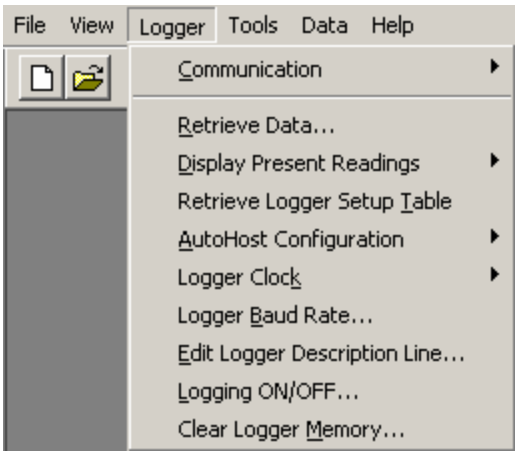


Example Connection Window

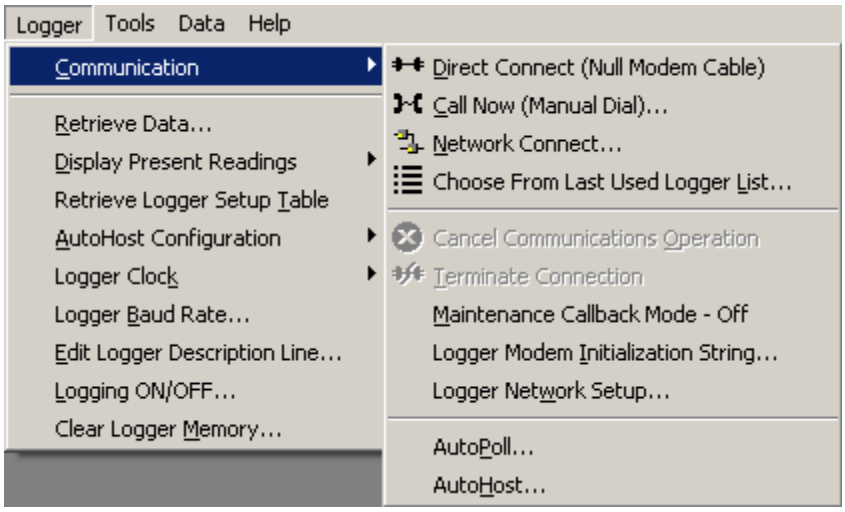
The **Toolbar** (hot buttons under the main menu) and the **Status Bar** (information line at the bottom of the screen) may be turned on or off by selecting ( ) or deselecting by clicking on them with the mouse.

Logger

Use this function to configure the ELITEpro Logger, view channel data in real time, and download Logger data and set a variety of logger communication parameters.



Communication — Use this command to establish a connection between the computer (PC) and the Logger.



Direct Connect (Null Modem Cable): This command is used to connect the Logger to a PC using a 9 pin null modem serial cable between the RS-232 serial ports on the computer and the logger. A connect message will appear on the screen.

NOTE: *Only a Null Modem serial cable between the logger and the PC will work for this connection.*

TECH TIP: *Quickly connect by clicking on the* ***Direct Connect*** *hot button on the screen.*

Call Now (Manual Dial): This function allows direct dialing from a PC to a logger when both the logger and PC are equipped with modems. After selecting this function, simply enter the telephone number of the logger to be called and press **OK**. The PC will then be directed to call the logger and initiate a communication session.

Network Connect: Enter the IP Address and Port Number and click OK to connect to a logger on the Ethernet network. This function also works with loggers connected to the Internet. See also the section SETTING UP AND USING THE ELITE*pro* AND DATA*pro* LOGGERS; Communication Via Local Area Network (Ethernet).

Choose From Last Used Logger List: If you have a number of remote loggers on a network or with modems, you may wish to add them to one or more Logger Lists where characteristics such as their serial number, telephone number, IP Address and so on are kept. To use Choose From Last Used Logger List... and just click on the Connect button next to the desired logger. To choose a logger from a different Logger List use File; Open; Logger List File and select the desired list.

> ***TECH TIP:*** You can also use the tool bar speed button to get the last used Logger List.

Cancel Communications Operation: During any communication operation between the PC and the logger (connecting, retrieving data, viewing real time values), this command may be used to cancel the current communication command.

Terminate Connection: Disconnects the computer from the logger (use for both direct and telephone modem connections).

> ***TECH TIP:*** *Quickly disconnect by clicking on the* ***Disconnect*** *button on the screen.*

Maintenance Callback Mode: When using the AutoHost feature of ELOG (described in detail at the end of this section) it is quite common to have the loggers call the PC in the middle of the night to avoid conflict with the telephone line during daylight or business hours. Sometimes it is desirable to have the logger call during a more convenient time to perform diagnostics or view the data collection in real-time.

Toggle the Maintenance Callback Mode on and off with the mouse. Placing ELOG in the Callback Mode disables all other communication options. In addition, while in this mode, ELOG will answer any incoming calls made to the computer.

Logger Modem Initialization String: Allows user to set the initialization string in the remote modem (the one inside the Logger). The Logger automatically sends the initialization string to the modem every day at midday and midnight. This feature resets the modem in the event of a modem lock-up.

Use this option to configure the remote (logger) modem. Consult the modem manual for proper settings.

Logger Network Setup: This function is used to set the addressing in a logger connected on a local area network. To use it you must be connected to the logger via a direct serial connection. See also Communication Via Local Area Network (Ethernet) in the Section 1.

AutoPoll: AutoPoll, short for *Auto*matic *Poll*ing, is a separate program that comes bundled with ELOG and is loaded onto the PC when ELOG is installed. AutoPoll may be used for unattended and automatic data retrieval from a number of remote loggers where the PC calls the loggers either over a telephone line or network. It can also be used for automatic, unattended calls to the logger through a direct serial connection from the PC to the logger. AutoHost (described next) may also be used for unattended and automatic data retrieval from a number of remote loggers where the loggers call the PC though only via telephone.

AutoPoll works in conjunction with a *Logger List*, which is a compilation of the remote loggers to be interrogated, their modem telephone numbers, call schedule, and other tasks to be performed. A complete description of Logger Lists is found with the description of AutoPoll.

AutoPoll has limited user interaction and should be thought of primarily as an automatic dialer. After launching AutoPoll, you are prompted to first select a Logger List containing the loggers that you wish to call. Only one Logger List may be active at a time.

A complete description of AutoPoll can be found at the end of this section in: *AutoPoll: Unattended Calls From The PC To The Logger*

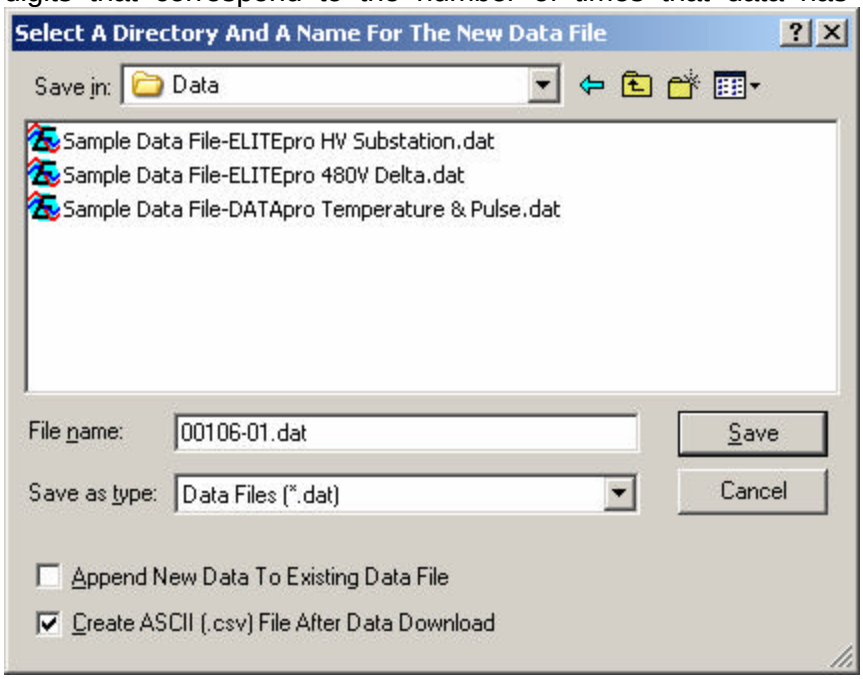
AutoHost: AutoHost, short for *Auto*matic PC *Host*ing, is a separate program that comes bundled with ELOG and is loaded onto the PC when ELOG is installed. **ELITE***pro* and **DATA***pro* loggers with modems can be configured to automatically *initiate* telephone data retrieval sessions. AutoHost is the application that answers the call from the logger and collects the data. (AutoPoll is the application that directs the PC to call the logger).

The AutoHost configuration function in ELOG allows storing in the logger a call-out schedule, task list and telephone number for the logger to call. At the time(s) specified in the configuration table stored in the logger, the logger will call a host computer at the telephone number in its memory. If the computer has the application AutoHost running, then the computer will answer the call and perform the data retrieval tasks programmed into the logger.

A complete description of AutoHost can be found at the end of this section in: AutoHost: Unattended, Logger Initiated Calls To The PC.

Retrieve Data...

Retrieves data from the logger and saves it as a .dat file to the hard disk. Before retrieving the data, you will be prompted for a file name to use. The default will be the Logger serial number plus 2 digits that correspond to the number of times that data has been retrieved from the Logger.



When a logger's memory is downloaded, the data may also be added or "appended" to an already existing file from the same logger. Simply check the Append New Data To Existing Data File box and select which file you wish to add the data to.

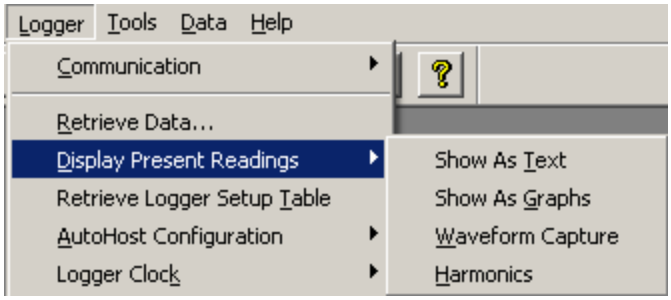
Also, when the data is downloaded a second file can be created at the same time that is a comma separated variable format (.CSV). A .CSV file is also called a "flat" or ASCII file and can be opened in other applications such as spreadsheets and databases.

The data will be saved to the folder as specified in Tools; PC Setup; Data Files Saved To: The default data folder is C:\Program Files\DENT\ELOG\Data

To view a data file, use Data; Open Data File; and then choose the file desired.

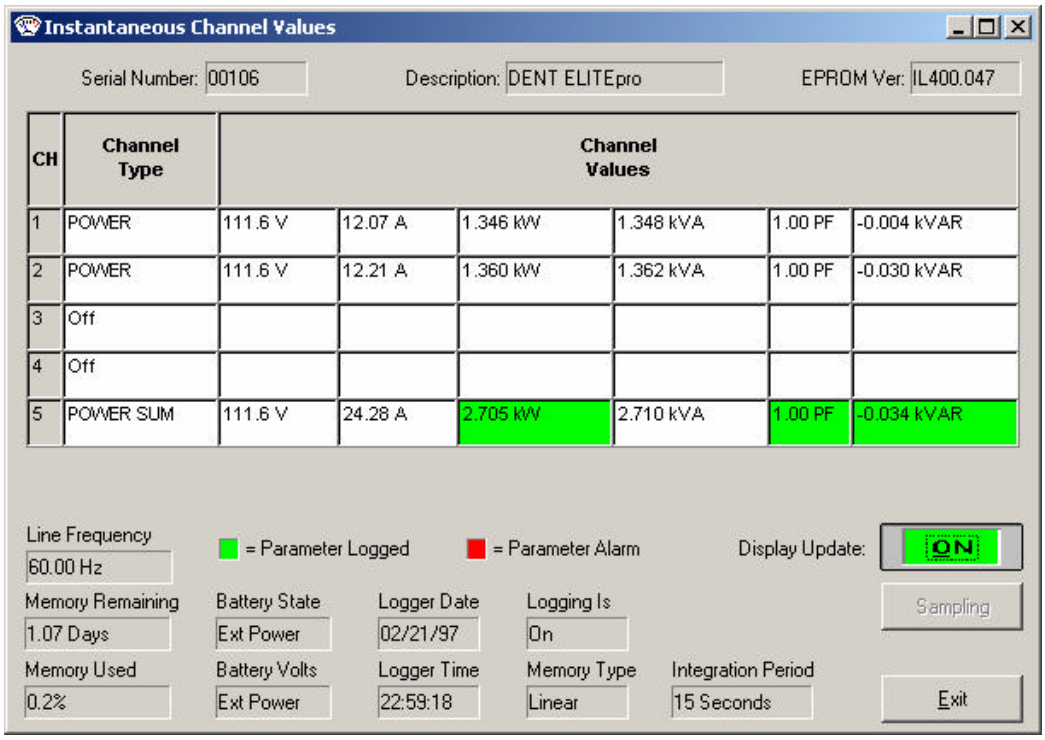
Even if not downloaded as a .CSV file, the original binary .dat data files may be exported in a comma delimited ASCII file with a .csv extension. To export a data file use the command Data; Export Data File...

> ***TECH TIP:*** *When retrieving data from a Logger that is connected to external DC power, the sampling rate is reduced from one read every three seconds to one read every 15 seconds. For Loggers that are operating on the internal battery the sampling rate remains at once per minute.*



Shows instantaneous readings for channels in use in either a textual or graphical format.

Show As Text: When this option is selected, a screen similar to the one below is shown. All of the channels that are turned on (even if not set to recording) are displayed simultaneously. If a parameter is being recorded by the logger, it will be shaded as shown below (the shading is green on color screens). For a Power Channel (as Channel 1 below), that means you will be able to see all six power parameters (V, A, kW, kVA, PF, and kVAR) even if only one of the parameters is being recorded. This feature is very useful for verifying correct installation of the Logger.

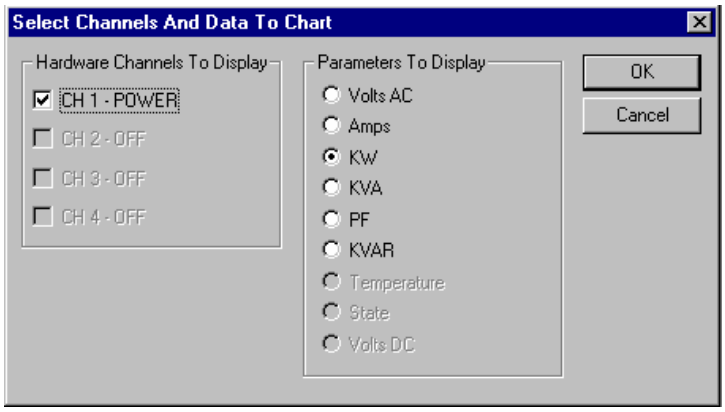


This screen provides information about:

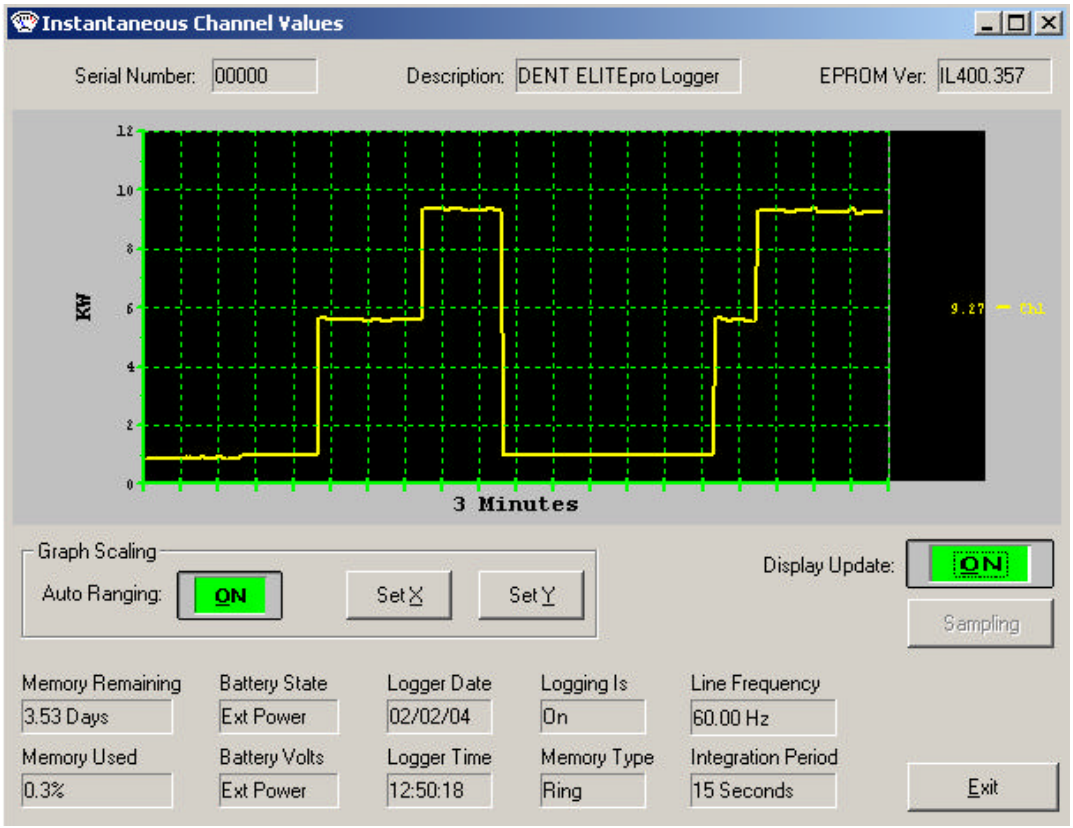
- The real-time data (which can be paused for cross-channel comparisons);
- The Line Frequency as measured from Channel 1 on L1;
- How many days the memory has remaining before filling;
- The logger battery condition (and if equipped, internal modem battery);
- The logger clock's current date and time;
- Whether or not the data logging is turned on;
- How much memory has been used;
- Type of memory: Linear (Stop When Full) or Ring (Continuous);
- The integration period, and;
- If a measurement is an alarm condition.

TECH TIP: *For* **ELITE***pro and* **DATA***pro loggers, if no current transformer is connected to a channel that is turned "on," nonzero readings will be displayed. You can use this feature to verify a current transformer connection. If the CT is connected but shows a "0" for a value, then the CT is probably connected but the monitored load is turned off. On the other hand if a constant (high) current is displayed, a CT wire may have come off of the logger.*

Show As Graphs: This feature is similar to the text version described above but shows the data in a graphical format. After selecting this option, a screen such as the one at right appears. Among the hardware channels to display will be all of the channels that are currently turned on in the logger. Selecting Power makes the **Parameters To Display** active and you may choose one variable to graph. You can only choose one variable at a time unlike the text option where you will see all parameters displayed simultaneously. This is because of differences in scaling and also to reduce clutter on the graph. For example, you could display kW from 4 channels simultaneously but not a kW and a KVAR even if from the same channel.



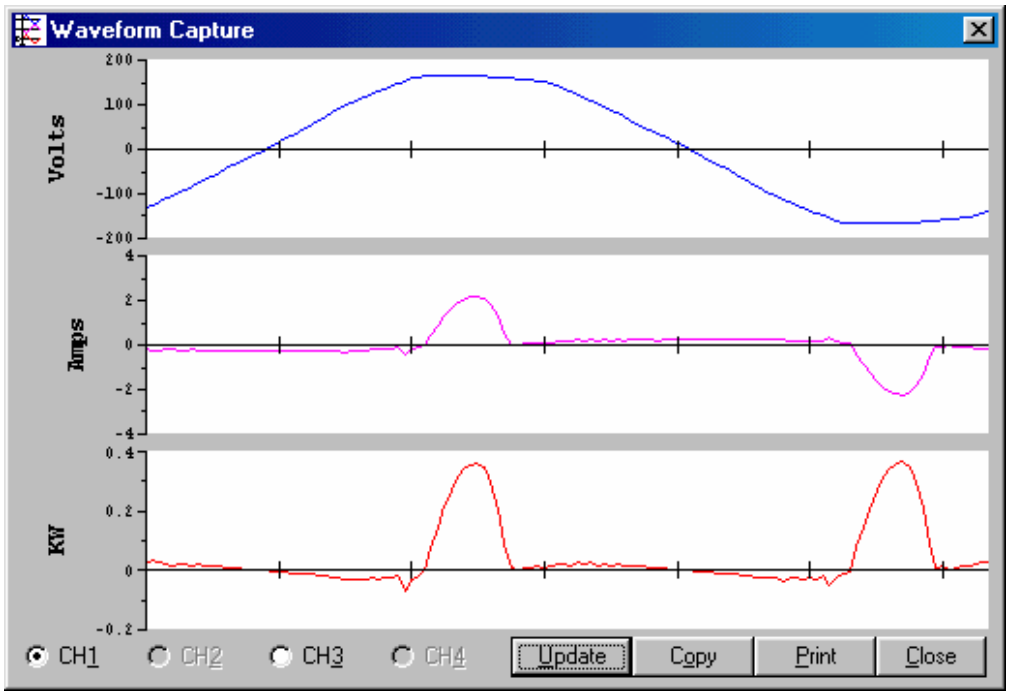
After selecting **OK**, a graph similar to the following appears:



This graphical presentation is very similar to paper strip chart recorders. The graph begins on the left edge and moves to the right. Upon reaching the right edge, the whole graph scrolls to the left with each new reading so that the most current data values are always shown and the older points slide off the left edge. By using the **Set X** feature, the amount of data shown can be varied from 1 second to more than 18 hours (65 000 seconds). Note that the X-axis scaling is only approximate.

The **Set X** and **Set Y** features can be used to set the scaling, colors, and line type (e.g., linear or logarithmic) and the number of grid lines that overlay the graph.

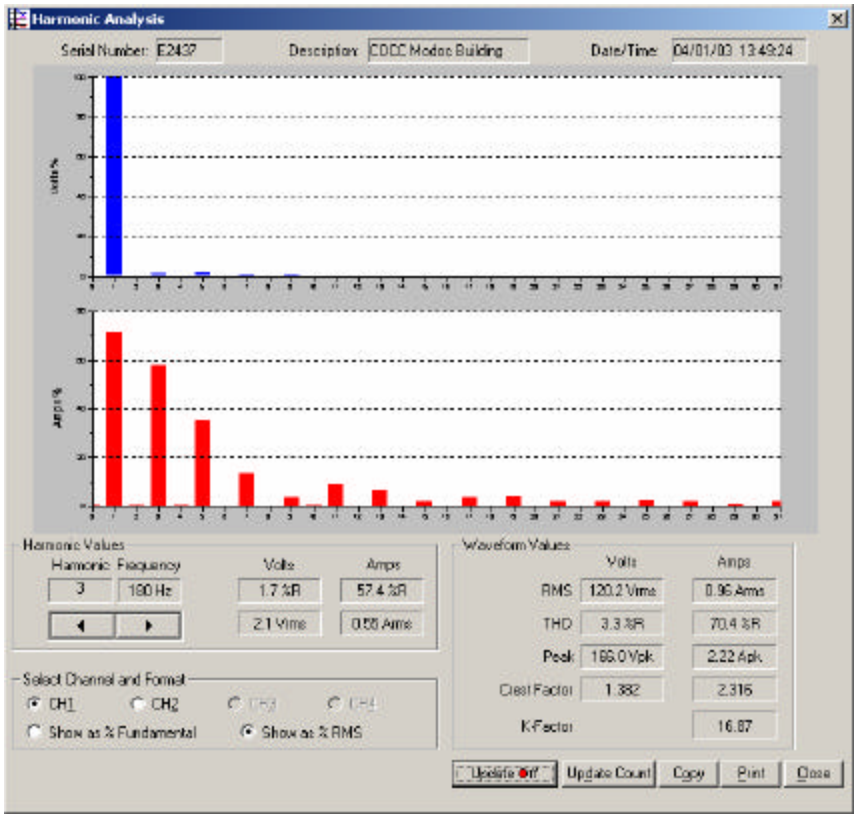
Waveform Capture: {**ELITE***pro* only} Use the software command *Logger; Display Present Readings; Waveform Capture* to see the actual current, voltage and power waveform. A typical (highly distorted waveform) display is shown below:



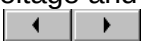
The buttons along the lower left side of the window select the Channel to be displayed. Only one channel may be viewed at a time. The image presented is a single snapshot in time. Use the **Update** button for additional views. Copy will capture the image on the clipboard for pasting into other programs.

> ***Note:*** *The image displayed above shows a highly distorted (current) waveform from a computer power supply. These waveforms are typical for switching power supplies and are a major cause of line harmonics. See also the graph below.*

Harmonics: {**ELITE***pro* only} The harmonic content of the previous, highly distorted waveform is shown below.



The buttons along the lower left side of the window select the Channel to be displayed. Only one channel may be viewed at a time. This screen includes a good deal of information. The voltage and current harmonics are presented graphically in the upper part of the window. The ordinate (y-axis) is scaled in percent of the fundamental. The abscissa (x-axis) is the harmonic. Both even and odd harmonics are shown together with the zero order, DC component.

The actual value of the voltage and current for each harmonic may be found in the Harmonic Values box. By clicking on the  buttons, details about higher or lower order harmonics may be determined. The Waveform Values box provides summary statistics for the overall current and voltage waveforms. This includes the RMS value, Total Harmonic Distortion (THD), Peak values, and Crest Factor.

> ***TECH TIP:*** *The individual harmonic values and THD can be shown as a percentage of the fundamental (IEEE Standard 1035-1989) or as a percentage of the total RMS value (CSA and IEC standard).*

The image presented is a single waveform snapshot. Use the **Update** button for additional views. Copy will capture the image on the clipboard for pasting into other programs.

> ***TECH TIP:*** *The default number of harmonics shown is 31 plus the DC component. To view additional harmonics (up to the 63rd) place the cursor on the horizontal axis of either (or both) the voltage or current bar graph then double click. In the Horizontal Axis dialog box, change the "**To:**" field to the number of the highest harmonic desired then click **OK***

Retrieve Logger Setup Table

This function retrieves the Setup Table in the Logger so it can be viewed, edited, resent to the logger or saved to the hard disk. See also page 1-2, **Setting Up The Logger**, in the previous section for more information on Setup Tables.

AutoHost Configuration ▸

ELITE*pro* and **DATA***pro* loggers can be configured to initiate telephone data retrieval sessions. AutoHost Configuration allows a call-out time schedule, task list and telephone number to call to be loaded into the loggers. At the time(s) sent, the logger will call a host computer at the number in its memory. If the computer has the application **AutoHost** running (AutoHost is found in the Logger; Communication menu) then, when the logger calls, the computer will answer the call and perform the data retrieval tasks programmed.

To use AutoHost, connect a logger to the serial port of a PC and use the ELOG command Logger; Communication; Direct Connect. Then use AutoHost Configuration; Send AutoHost Configuration (*or* Retrieve AutoHost Configuration) to call up a configuration table to edit. Using Retrieve will call up the AutoHost configuration already in the logger. Using Send will call up a blank configuration if Retrieve has not already been used. If Retrieve has been used in the current ELOG session, then the AutoHost configuration shown will be the one brought from the logger. The configuration table must have set as a minimum, the telephone number of the host computer to call, a call time, and a task (set clock and/or download data).

Store AutoHost Configuration: This function is used to send an AutoHost Configuration file (callout schedule and task list) to the logger. If no AutoHost Configuration has been retrieved from the logger, the Store AutoHost Configuration command will produce a blank configuration table. The blank table may then be edited and stored in the logger.

The software does not save AutoHost Configurations. Instead, a configuration table may be retrieved from a logger, edited and then resent to the logger. The configuration settings remain active in the computer until ELOG is closed. The active configuration settings may be downloaded to any number of loggers to accelerate setting up the loggers for automatic calling to the host computer.

Retrieve AutoHost Configuration: This function will retrieve the callout schedule and task list from the logger for viewing, editing and re-sending to the logger.

See also the section *AUTOHOST: UNATTENDED, LOGGER INTIATED CALLS TO THE PC*

This function is used to set the Logger's internal clock time and date. You may change the clock manually or synchronize it to the computer's clock.

Manually Set Logger Time: Allows user to set the logger date using the MM/DD/YY format. Also allows user to manually set the internal clock. *Use a 24-hour clock format*.

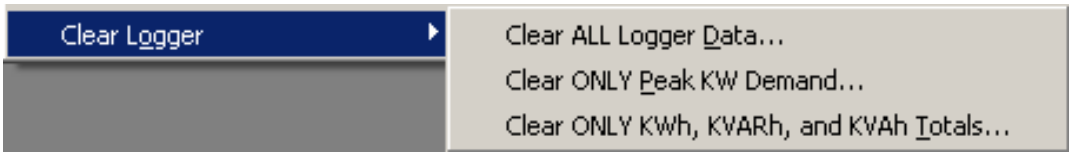
Synchronize Time To Match PC: With this option the computer clock is read and automatically updates the Logger.

> ***NOTE:*** *The* ***Synchronize...*** *function does not ask if you are sure if you want to set the logger clock to match the PC before doing so.*

The choices are baud rates of 1200, 2400, 4800, 9600, 14400, 19200, 28800 and 57600. When using modems for remote communication the maximum communication speed is 14400 baud. Use this option carefully when making a modem connection, as the Logger, computer, and both modems must **ALL** be set to the same value.

This option allows you to change the user-defined, one line description in the Logger. The Description Line can be used to help identify the specific logger after the Logger has been retrieved from the field.

This option starts and stops data collection.

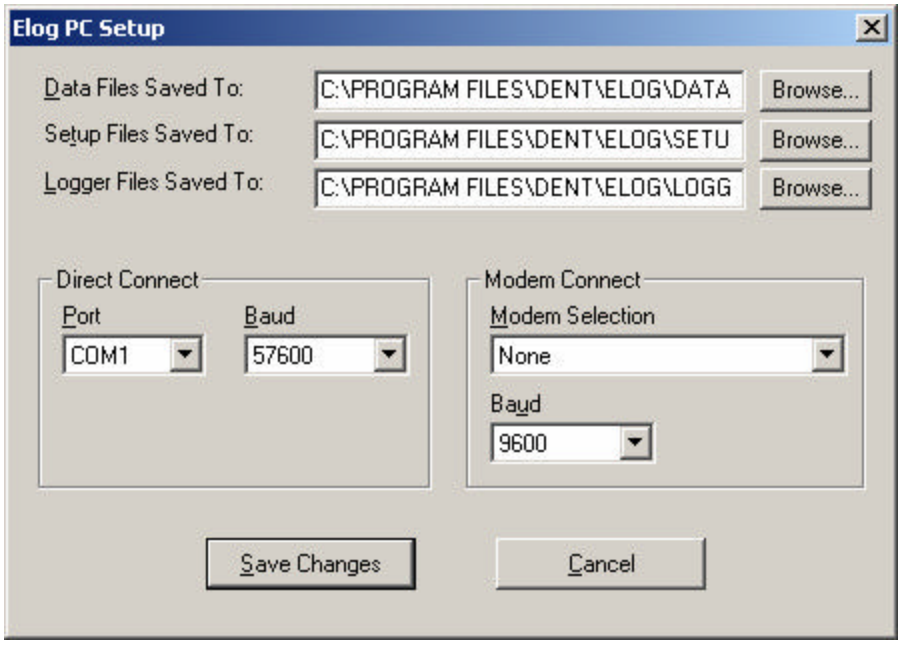


There are three options. Note that Clear ALL Logger Data clears all the time series data in the logger memory as well as the Peak kW Demand register and the kWh, kVARh, and kVAh totalizer registers.

CAUTION: Do not select this menu item unless you are absolutely positive that you want to delete the information from your logger. Once deleted, the data may not be retrieved.

Tools; PC Setup:

PC Setup allows the user to configure the host computer. It sets the default file storage folders and configures the direct connect baud rate and port and the PC modem, and modem baud rate.



Data Files Saved To: Sets the default folder the data files will be saved in. When retrieving data files using the **Logger; Retrieve Data…** function, the data files will be sent to the folder specified here.

Setup Files Saved To: Sets the default folder the Setup Tables will be saved in. When opening a Setup Table file ELOG will look in this folder first.

Logger Files Saved To: Sets the default folder the Logger files will be saved in. When using the automatic data collection program AutoPoll, ELOG will look in this folder first for the Logger Lists to call.

Append Downloaded Data To Existing Data File: When this box is checked, anytime a logger is read the data retrieved will be appended to any previously existing data file from that logger. If ELOG does not find an existing data file in the default folder defined above (or the name of the file has been changed), then ELOG will download a complete data file. This feature is very useful for long term metering projects where periodic data downloads are made.

Direct Connect: Configures the computer for directly connecting (via the RS-232 port) to the Logger. The Computer communication ports (1, 2, 3, or 4) and Baud Rate (1200, 2400, 4800, 9600, 14400, 19200, 28800 or 57600) can be set from this menu.

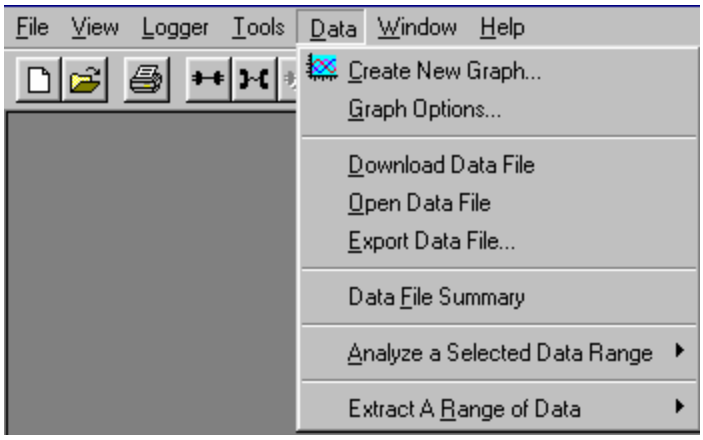
Modem Connect: Configures the computer for remote communication. Select only the modem to use and the Baud Rate (1200, 2400, 4800, 9600 or 14400). ELOG uses the Windows 95 and higher TAPI protocols which let the user select which modem to use. Changing the computer (local) modem Initialization String is done from Windows in Control Panel, Modems, General tab, Properties button, Connection tab, Advance button, Extra Settings line.

> ***TECH TIP:*** *Quickly set up the PC by clicking on the* ***PC Setup*** *button on the screen.*

Data

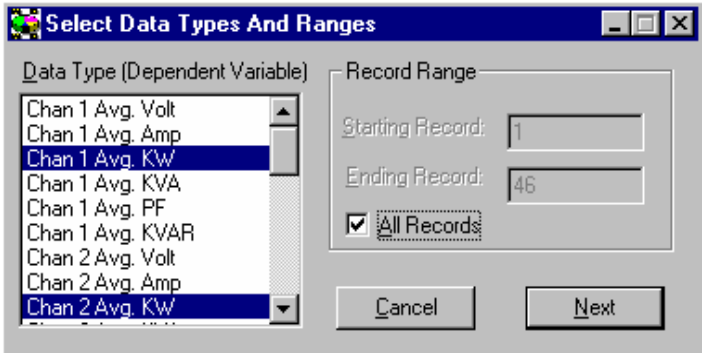
Once the data stored in the Logger has been retrieved to a PC and the file opened there are a large number of analysis, graphing, and exporting options are available.

Additional analysis and graphing features are continuously being added to ELOG. Consult with DENT Instruments for availability.



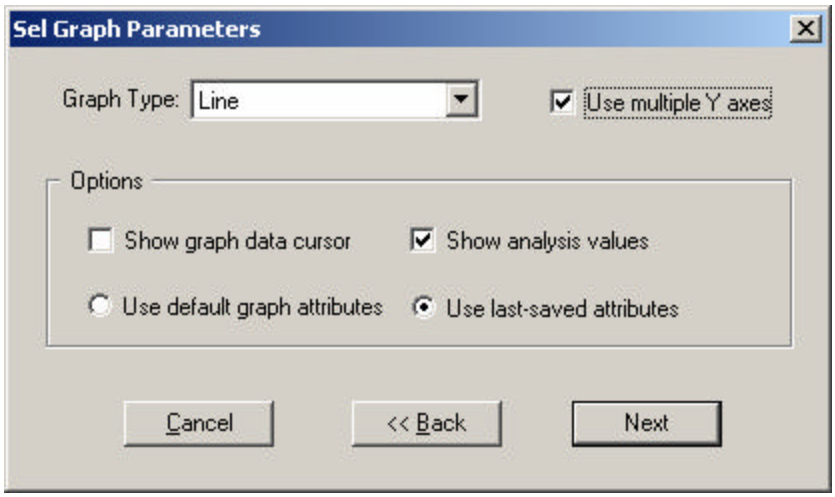
If a data file is not already open, clicking on this menu item will first bring up a folder from which to select a data file to be used to create a graph. If a data file is open, selecting this menu item will again open the file folder but will default to the file that is already open.

After selecting a data file, a screen similar to the example below will appear:

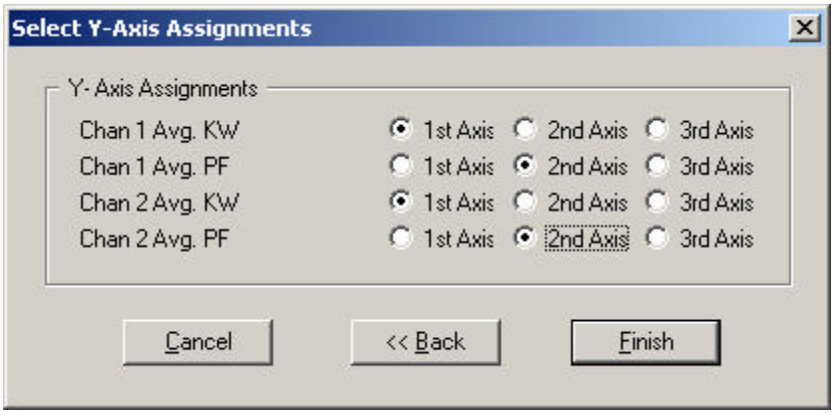


Use the mouse to select which parameters contained in the data file you wish to graph. Use standard Microsoft Windows functions to select parameters such as: Tag multiple parameters simultaneously by clicking on the first one and then hold down the Control (Ctrl) key and click on any other desired parameters; to select a continuous group of parameters, click on the first one and then hold down the Shift key and click on the last parameter in the group. This will select all parameters within the group including the first and last ones.

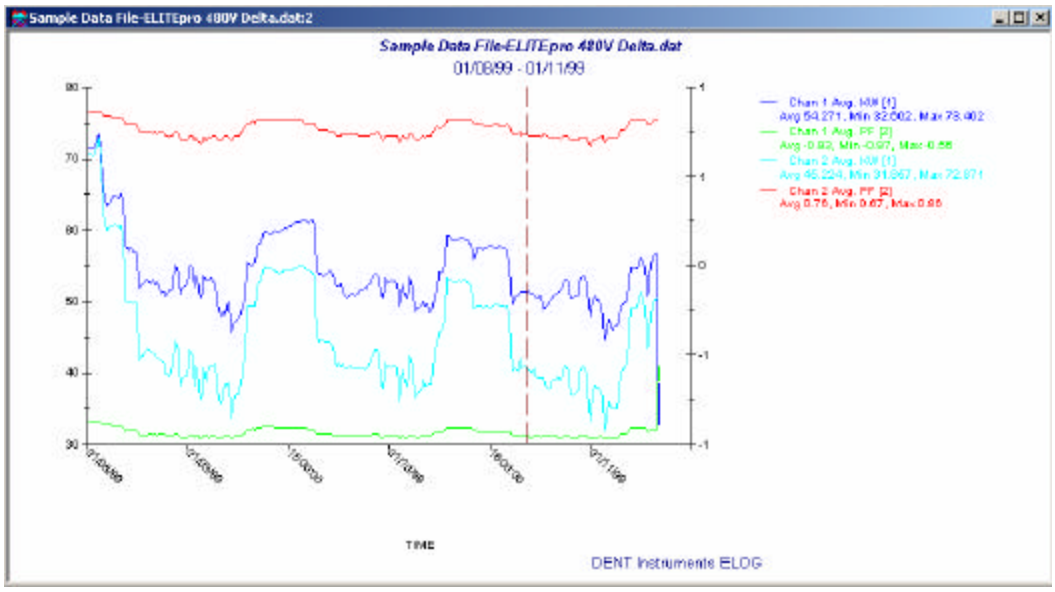
After selecting the parameters to graph, click **Next** to define the type of graph to make. Click on the down arrow to reveal the graph type options. Click the data cursor check box to have the data cursor appear when the graph is created (you can also toggle the data cursor on and off with the right mouse button). Use the radio buttons to choose between using the default graph parameters (colors, fonts, etc.) and those used in the last graph created. You can also choose to show summary statistics (minimum, maximum, average) on the graph by checking the Show analysis values box.



If you have selected more than one parameter to plot the Use multiple Y axes box will appear. If checked, you will get a third window that allows you to assign which parameters are assigned to which Y axes.


Select Y-Axis Assignments
Y- Axis Assignments
Chan 1 Avg. KW 1st Axis 2nd Axis 3rd Axis
Chan 1 Avg. PF 1st Axis 2nd Axis 3rd Axis
Chan 2 Avg. KW 1st Axis 2nd Axis 3rd Axis
Chan 2 Avg. PF 1st Axis 2nd Axis 3rd Axis
Cancel
<< Back
Finish

Click **Finish** and the graph you have defined will appear similar to the example shown on the next page. Though difficult to see, the parameter names to the right of the graph have a number (1, 2, or 3) in parentheses that indicates which Y – axis they are referenced to. Notice the vertical dashed red line data cursor in the graph.



The graph values that are intersected by the Data Cursor are shown in the lower left hand corner of the screen.

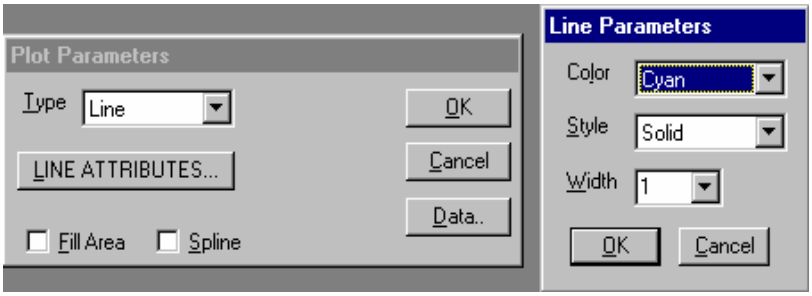
Values for 01/10/99 20:15:00: 51.415, -0.95, 40.830, 0.74

Once created, the graph may be edited in a number of ways. In general, any editable feature may be changed by double-clicking on the feature and making changes in the dialog box that appears. A few examples follow.

TECH TIP: *Quickly open a data file and create a graph by clicking on the* ***Create Graph*** *hot button.*

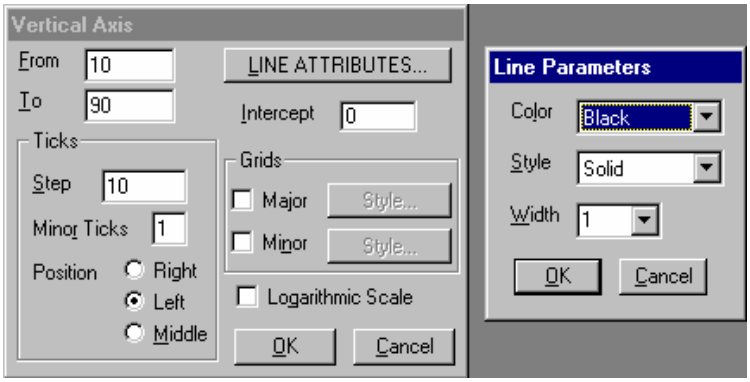
By double-clicking on one of the parameters that are graphed, the following screen appears from which the graph type, color and other parameters may be changed:

NOTE: *The Line Parameters box is found by clicking on the Line Attributes... button.*



Double-clicking on the vertical axis produces the dialog box below that can be used to change scale, add grid lines and tick marks.

NOTE: *The Line Parameters box is found by clicking on the Line Attributes... button.*



Clicking on the axes text will allow you to change the font and size of the labels.

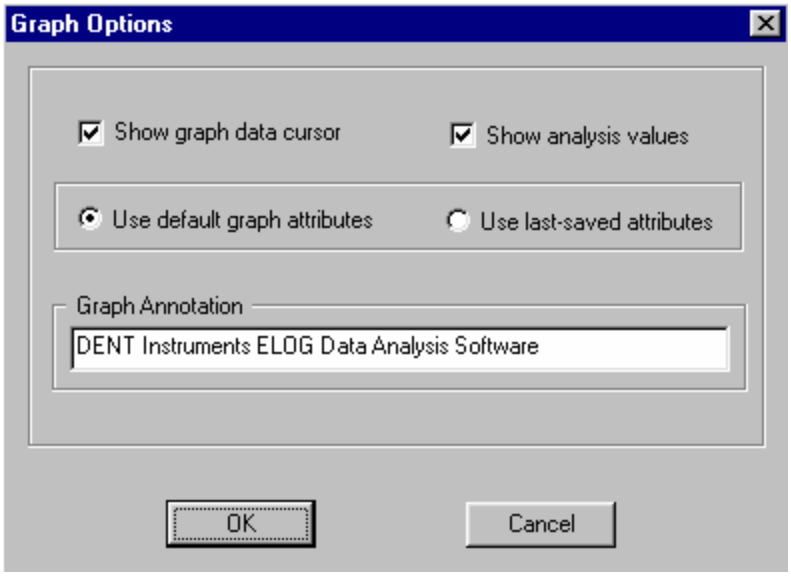
TECH TIP: Zoom *To zoom in on a portion of the graph, position the mouse pointer near the area to be zoomed. Hold the Control (Ctrl) key and left mouse button down, then drag the pointer to make a rectangle that covers the area to be zoomed. Let go of the mouse and Control key and the graph will redraw a zoomed portion of the graph.*

The graph may be zoomed as many times as desired. Use the ***View; UnZoom****, Ctrl U, or the* *key to unzoom in reverse order of the zoom.*

TECH TIP: Data Value *To determine the actual value of any data point in a graph place the mouse pointer over the point in question and push the right mouse button. The X (time) and Y (value) of the point will be shown in the lower left corner of the screen.*

Graphs as well as other file types (Data, Setup Tables, Logger Lists) may be printed using the **File; Print…** command (or Ctrl + P).

The Graph Options function allows you to set several defaults used when a new graph is created. The Graph Options window is shown below.



Graph Data Cursor: The data cursor is a vertical line that appears on a graph and is used to show the exact time and value of a data point in the graph. Use the Show graph data cursor check box to turn on the data cursor. It can also be turned on and off at any time while viewing a graph by simply clicking the right mouse button. The time and value of the graph where the data cursor intersects it is shown in the bottom left corner of the screen.

If there is more than one variable plotted, all values are shown on the screen. The values are not labeled but are shown in the same order that the variables appear in on the graph.

The data cursor may be moved by using the left-right arrow keys or by using the mouse to left click on the cursor and drag it to the desired location. (Note: You will not see the cursor move when using the mouse until releasing the left mouse button.)

Analysis Values: For each parameter plotted on a graph the average, maximum and minimum value is also shown to the right of the graph where the graph labels are also shown. If desired, by unchecking the Show analysis values box, the values will not be shown (or printed) on the graph.

Graph Attributes: The graph attributes include font sizes, background colors, graph colors and numerous others. Every time a graph is made and there is a change to any of the attributes the changes are remembered by ELOG. At the creation of the next graph you have the option of using the default graph attributes or the changes that were last made. Once a graph is made you cannot change the graph attributes using this window. You must change them from the graph itself.

Graph Annotation: If you make a lot of graphs and want to have the same annotation on the graph you may use this feature to add a description to the graph. Common uses are the name of the consulting company performing the metering and analysis or the name of the client.

Download Data File This function is identical to the **Retrieve Data…** command in the **Logger** menu. It is used to download the data from the logger to the PC prior to viewing, graphing or exporting.

Open Data File Data files stored on the PC can be viewed (but not edited) by selecting this menu item. To view a data file it must first be downloaded from the Logger by using the **Logger; Retrieve Data...** command or **Data; Download Data File** described above. After selecting a data file to open, a screen similar to the one below will appear.

	Record Date	Record End Time	Chan 1 Avg. Volt	Chan 1 Avg. Amp	Chan 1 Avg. KW	Chan 1 Avg. KVA	Chan 1 Avg. PF	Av
1	12/10/98	16:35:00	120.2	88.84	9.695	10.675	0.91	4.394
2	12/10/98	16:40:00	121.1	81.17	8.512	9.830	0.87	4.877
3	12/10/98	16:45:00	121.1	87.45	9.276	10.590	0.88	5.068
4	12/10/98	16:50:00	121.1	85.23	9.068	10.317	0.88	4.878
5	12/10/98	16:55:00	121.1	83.02	8.681	10.049	0.86	5.030
6	12/10/98	17:00:00	121.1	89.58	9.642	10.841	0.89	4.918

The data is always shown in the same way. The left-most column is the record number and begins with 1 and continues through all of the data records in the file. The second column is the date of the record and the third column is the time of the record.

The fourth and remaining columns will be the data recorded by the logger for each parameter. If minimum or maximum values were recorded then the time, to the second, that the maximum or minimum occurred will also be recorded.

TECH TIP: *To change the date format of the data time stamps in columns 1 and 2, use Start, Settings, Control Panel, Regional*

NOTE: *To view all the data when it does not fit on one screen, use the up/down, right/left scroll bars to move through the data.*

TECH TIP: *To edit a data set, first export the data as described below and then reopen it in another application such as Excel.*

Export Data File... Exports the raw, binary .DAT file to a .CSV format (Comma Separated Variable) file, which can be brought into a spreadsheet or database program.

To view the data from a spreadsheet program such as Excel or Lotus 1-2-3, follow these steps:

1. Retrieve the data from the Logger
2. Export the data to .CSV file
3. Start the spreadsheet program (Lotus or Excel).
4. Use the File | Open command in the spreadsheet and select "All Files" in the Files of type: box
5. Open the .CSV data file from the folder you specified, for example, C:\Program Files\DENT\ELOG\Data*name of file.csv*

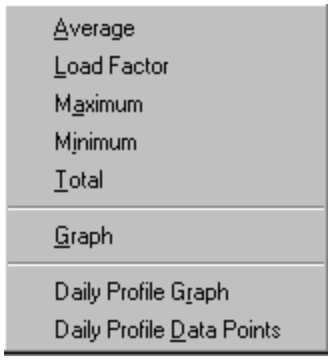
Data File Summary The Data File Summary is a very useful feature to see, at a glance, a lot of information about the data file, the logger used to collect the data, and the setup table used in the logger. This is where the Peak kW Demand and kWh, kVARh, and kVAh totalizer values are found. An example Summary is shown below.

```
Data Summary
------------
Data File Name: 00000-01.dat

First Data Record End Time: 02/02/04 12:55:15
Last Data Record End Time: 02/02/04 12:58:30
Monitoring Period Duration: 0.00 days

Peak Demand: 277.002kW on Monday 02/02/04 at 12:55:00

Total Usage (Channel 5): 11kWh, 15kVAh, 0kVARh
Total Usage (Channel 6): 0kWh

                Average   Maximum (Date Time)          Minimum (Date Time)          Total
--------------------    -------------------------  -------------------------   --------
Chan 1 Avg. KW  112.373  151.521 (02/02/04 12:55:30)  98.160 (02/02/04 12:58:15)  1573.228
Chan 1 Avg. PF  0.75     0.76 (02/02/04 12:58:15)     0.73 (02/02/04 12:55:30)    10.52
Chan 2 Avg. KW  113.959  153.113 (02/02/04 12:55:15)  99.800 (02/02/04 12:56:30)  1595.427
Chan 2 Avg. PF  0.75     0.77 (02/02/04 12:57:45)     0.73 (02/02/04 12:55:30)    10.53
Chan 5 KW Hours 0.943    1.269 (02/02/04 12:55:30)    0.825 (02/02/04 12:58:15)   13.204
Chan 5 Avg. KVA 301.104  416.661 (02/02/04 12:55:30)  259.440 (02/02/04 12:58:15) 4215.459
Chan 5 KVAR Hours 0.068  0.075 (02/02/04 12:56:45)    0.053 (02/02/04 12:55:30)   0.958

Setup Summary
-------------
Setup Table Description:

Channel 1 - Power: VHi: L1, VLo: N; PT = 100.000; CT = 150.000
Channel 2 - Power: VHi: L1, VLo: N; PT = 100.000; CT = 100.000
Channel 5 - Power Sum: 1,2

Memory Type: Ring
Line Frequency: 60 Hz
Integration Period: 15 Seconds

Channel 5 Peak kW Demand Window: Moving, Width = 1 minutes

Logger Summary
--------------
Logger Description Line: DENT ELITEpro Logger
Logger Serial Number: 00000
Logger type: ELITEpro
Firmware Version: IL400.057
```

The file is divided into three parts: The first is the Data Summary and gives the start and end times of the data, file name in the PC, and summary statistics for each channel and parameter that was recorded by the logger. The second part is the Setup Summary and it shows the essential features of the setup table that was active in the logger during the data collection period. The third part is the Logger Summary and provides information about the logger used to collect the data.

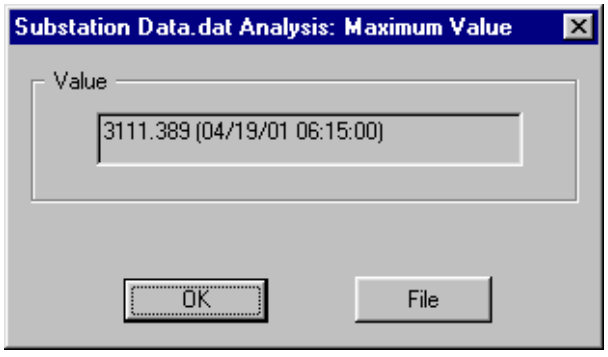
The Data File Summary is opened in Microsoft Notebook and can be edited, saved, printed or moved into another report.

ELOG also has a number of analysis features. With a data file open, click on the Analyze a Selected Data Range menu to show the various options available. The analyses features ***only work on a selected range for one variable at a time***. A variable may be selected in several ways all using standard MS Windows methods. To select an entire column of data, place the mouse pointer over the column header (e.g., Chan 1 Avg. Amp) and click the left button. The entire column should be selected. To select a portion of a column, place the mouse pointer over the first record to be included then push the left button down and hold it while dragging the mouse down the screen. When located over the last record to be included, release the mouse button.



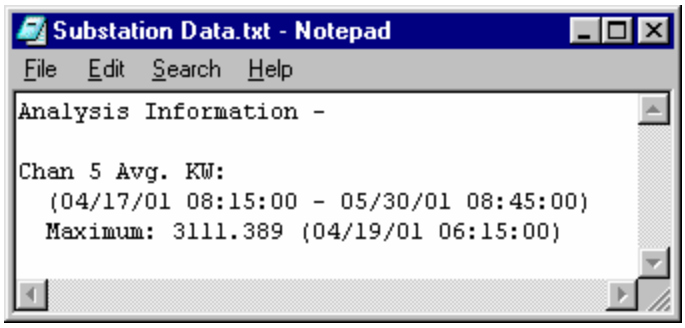
> ***TECH TIP:*** *All analysis features in the Analyze a Selected Data Range and Extract (described below) can be quickly accessed using the right mouse button. First use the mouse to select a range of data for analysis by dragging holding the left mouse button down over the first record in the range and then dragging the mouse until the last record and releasing the button. Then place the mouse pointer over the selected range and use the right button.*

Once a data range has been selected, use the mouse to select the analysis desired. A window such as shown will appear:



In this case, Maximum value was chosen after selecting the kilowatt draw measured by an ELITEpro. Note that when maximum and minimum are selected, the date and time of the maximum (or minimum) is also shown along with the value. In all cases, clicking on "OK" merely closes the window.

If “File” is selected, ELOG opens MS Notepad and a window similar to the following appears:


Substation Data.txt - Notepad
File Edit Search Help
Analysis Information -
Chan 5 Avg. KW:
(04/17/01 08:15:00 - 05/30/01 08:45:00)
Maximum: 3111.389 (04/19/01 06:15:00)

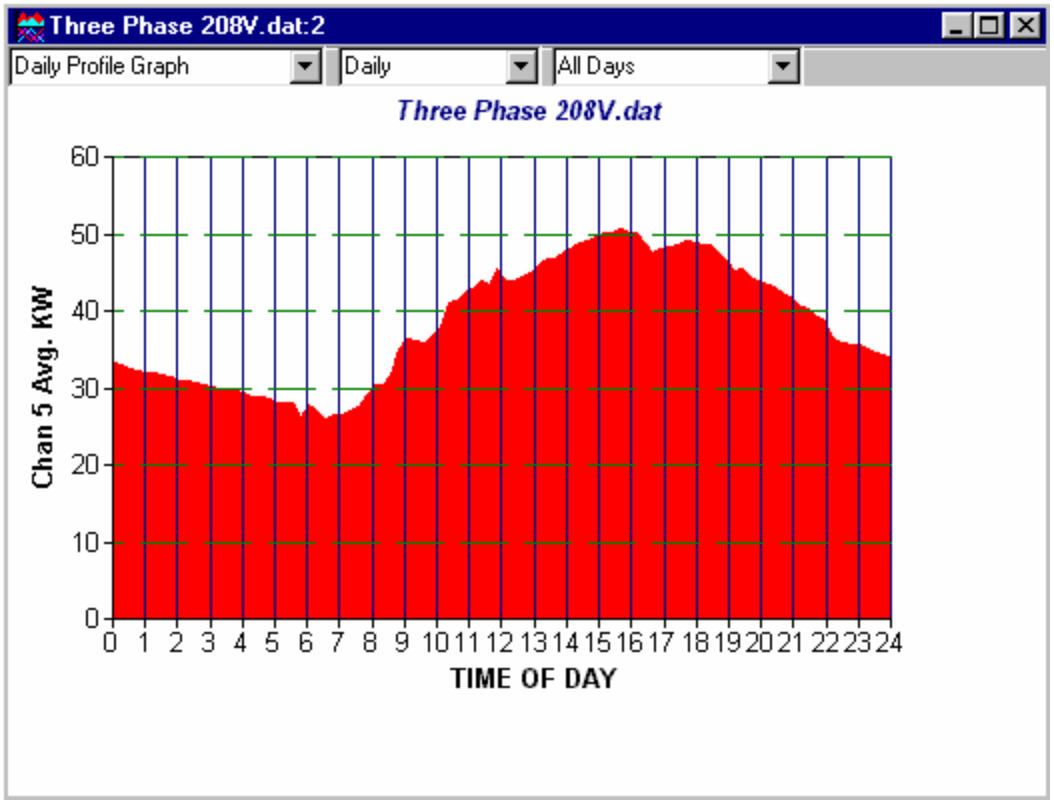
Together with the maximum value and time of occurrence is shown the date range for the piece of the data that selected for analysis. As with the Data File Summary, the data contained in the Notepad file may be edited, saved, printed or moved into another program for reporting generation.

Each time an analysis function is used and “File” is selected, Notepad is opened and the result of the analysis function ***is added to the existing Notepad file***.

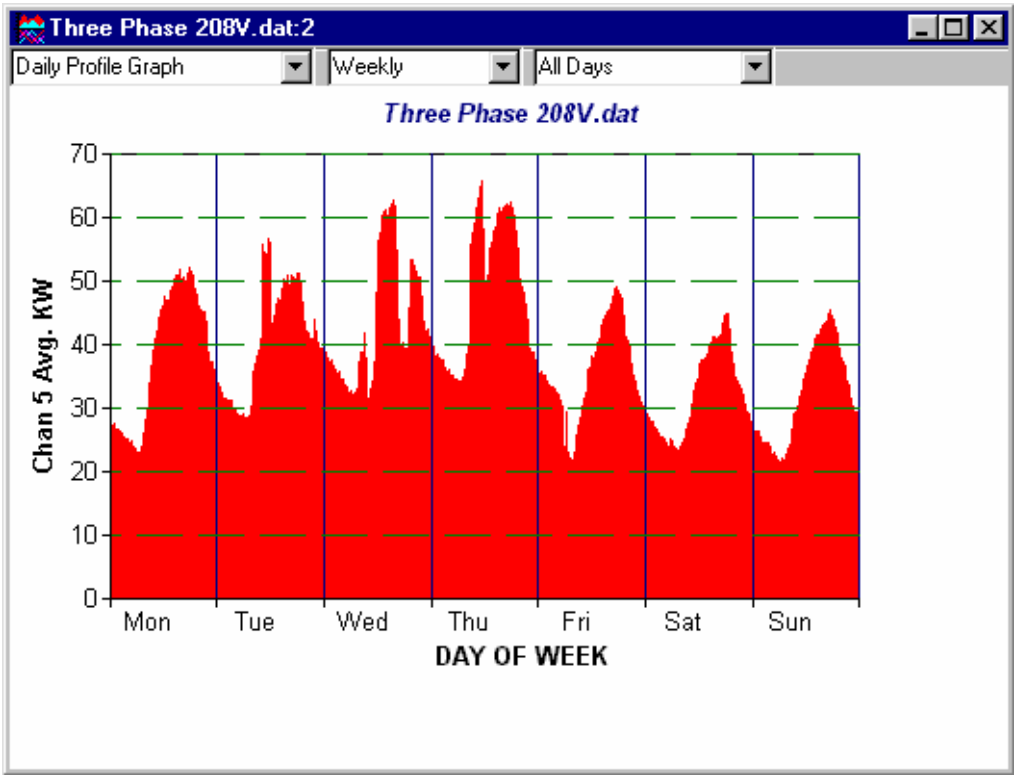
For the first five analysis functions, Average is the arithmetic average of all the values in the selected column within the date range of data selected. Load Factor is the ratio of the peak (maximum) value divided by the average value. Maximum and Minimum are the largest and smallest values together with the day and time of the occurrence. Total is the algebraic sum of all the values (useful for summing kWh within a specified period of time).

For any selected variable and range, “Graph” can also be used to create a quick line graph.

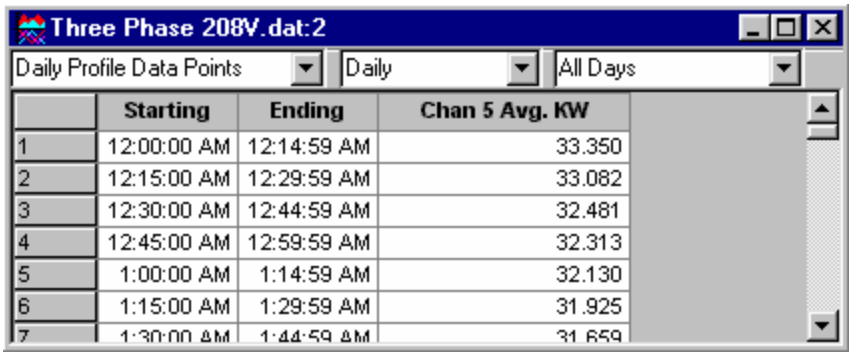
Daily Profile Graph and **Daily Profile Data Points:** (also called Load Profiles) can be used to create 24 hour or 7 day load shapes of the any desired parameter. As before, select a range of data (or the whole column) for a parameter for which you wish to create a Daily Profile. Then use the mouse to select the menu item Data; Analyze the selected Data range; Daily Profile Graph. An example Daily Profile is shown below.



Note that there are a number of controls accessible from the graph. By clicking on the down arrows at the top of the window, the Daily Profile Graph may be changed to display the Daily Profile Data Points that make up the graph (first arrow). The middle down arrow allows changing from a Daily Shape to a Weekly Profile as in the example below. Lastly, the third down arrow allows you to select between using all day types (weekdays and weekend days) to make the profile, to using only week days or just weekend days. Especially true for kW load shapes, it is very typical for weekday profiles to be very different from weekend day profiles as can be seen in the weekly profile below where all seven days of the week are shown separately.



The following is an example of the data points used in creating the daily profile graph. Note that the interval between the data points is always the same as the integration interval used when the data was collected. E.g., if the data was collected at 15 minute intervals then there will be 96, 15 minute points in the daily profile. Also, a weekly profile would then have 7 X 96 = 672 points in the graph.

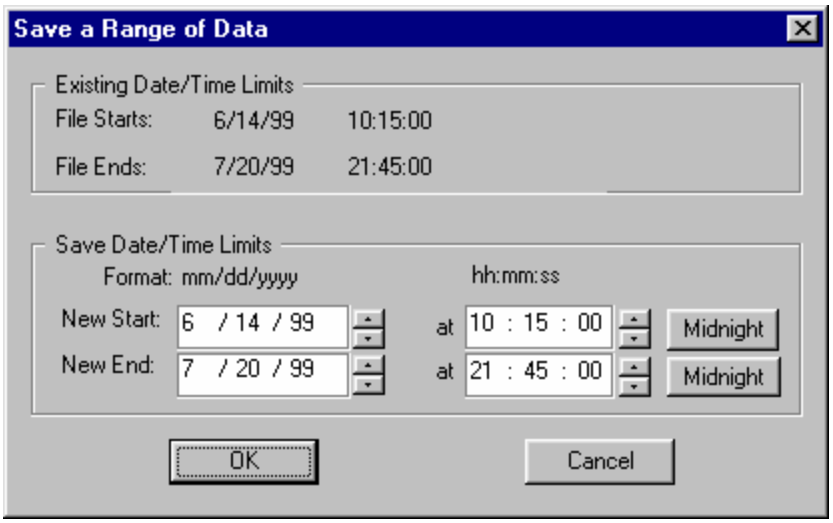


	Starting	Ending	Chan 5 Avg. KW
1	12:00:00 AM	12:14:59 AM	33.350
2	12:15:00 AM	12:29:59 AM	33.082
3	12:30:00 AM	12:44:59 AM	32.481
4	12:45:00 AM	12:59:59 AM	32.313
5	1:00:00 AM	1:14:59 AM	32.130
6	1:15:00 AM	1:29:59 AM	31.925
7	1:30:00 AM	1:44:59 AM	31.659

Daily Profile Graphs and the corresponding data points can also be saved or printed using the File; Save As command. The data points are saved as comma separated variable files (.csv) and the graphs are saved as Windows Metafiles (.wmf).

Sometimes it is useful to use only part of a data file. For example, the beginning and end of a data file may include records that do not correspond to the actual monitoring period. Perhaps data collection was started before the logger was connected or the logger was removed and continued to collect data before logging was stopped or the data retrieved from the logger. In these instances, it is desirable to remove the beginning and end of the data file so the non-monitoring records are not included in the subsequent analysis. ELOG offers two ways to extract only the desired range of data from the “middle” of a data file: either by a date range or by record number.

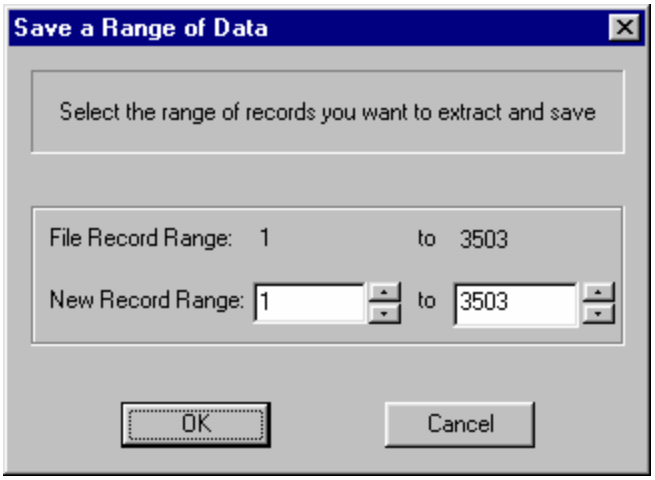
Extract By Date: Allows you to enter a beginning and ending date and time for the data you wish to keep. Data before the beginning date and time and also data with a time stamp after the ending date and time are trimmed off. When using this command, the following dialog box is opened. Note that the top of the box shows the beginning and end times of the first and last records in the data.



In the bottom half of the window, place the mouse pointer over the date or time to be change and click the left button. Then type in the new date or time or use the up/down arrows to change the values to those desired.

TECH TIP: Use the Midnight buttons to quickly set the times to 00:00:00 and thus make the date range occur on the day boundary.

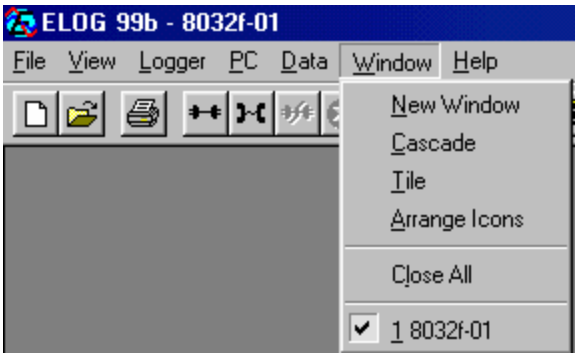
Extract By Record Number: is similar to Extract By Date but allows you to clip a section out of a data file based on the desired record numbers. Sometimes it is easier to look at the data file (using Data; Open Data File) and then scan the data to find the records in the data where the desired data begins and ends. The record number is always shown in the leftmost column. Using the window shown, simply change the start and end numbers in the New Record Range to those desired.


Save a Range of Data
Select the range of records you want to extract and save
File Record Range: 1 to 3503
New Record Range: 1 to 3503
OK
Cancel

Using either method to extract a range of data will open a new window on the screen of the extracted data file. From there it may be analyzed as any other data file or saved using File; Save As. In addition, if the extracted file or ELOG is closed a warning message will be displayed asking if you want to save the extracted data.

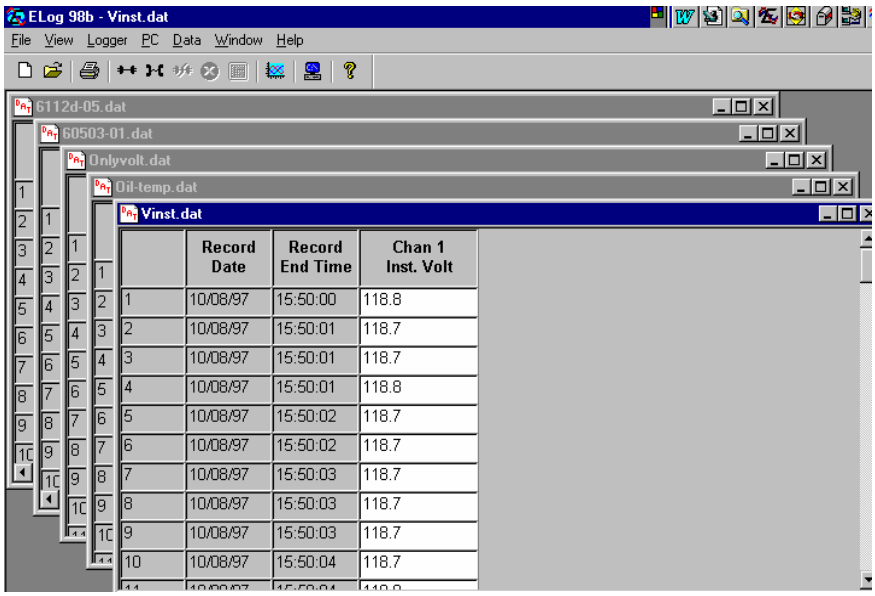
TECH TIP: A shortcut method to an extraction is to use the mouse to select the range of data desired then place the mouse pointer over the highlighted range and push the right mouse button. Then select Extract. Note that all columns in the data are extracted even if only one column is selected.

Window



New Window Opens another copy of the data file to view or from which to make graphs.

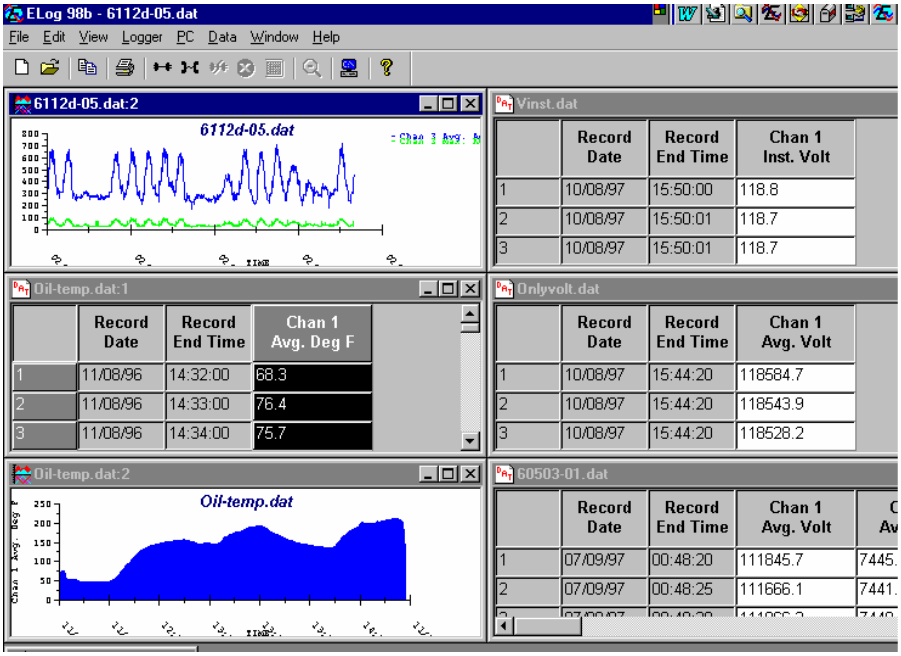
Cascade If multiple windows (data files or graphs) are open simultaneously, using the Cascade command will organize the open files one on top of the other as shown below.



	Record Date	Record End Time	Chan 1 Inst. Volt
1	10/08/97	15:50:00	118.8
2	10/08/97	15:50:01	118.7
3	10/08/97	15:50:01	118.7
4	10/08/97	15:50:01	118.8
5	10/08/97	15:50:02	118.7
6	10/08/97	15:50:02	118.7
7	10/08/97	15:50:03	118.7
8	10/08/97	15:50:03	118.7
9	10/08/97	15:50:03	118.7
10	10/08/97	15:50:04	118.7

Tile

If multiple windows (data files or graphs) are open simultaneously, using the **Tile** command will organize the open files side by side for simultaneous viewing as shown below.



Arrange Icons

If multiple graphs or data files have been opened and then minimized, the Arrange Icons command will order them neatly along the bottom of the screen.

Close All

Closes all open windows (data files or graphs).

Hot Buttons

ELOG has a number of Hot Buttons that can be used to speed some of the more commonly used commands such as making a direct connection from a PC to a logger. Instead of using the menu commands **Logger; Communication; Direct Connection (Null Modem Cable)** simply click on the button. The button tool bar can be toggled on and off by checking or unchecking the **View; Toolbar** box.

A description of the hot buttons follows:

New: Create a new Setup Table, Logger List, Data File (download), or Graph

Open: Open an existing Setup Table, Logger List, Data File, or Graph

Print: Print the active window

Direction Connection: Use for connecting the logger to the PC when using a serial cable

Network Connection: Use for connecting a PC to a logger that is on a local area network

Manual Dial: Use for direct dialing a remote logger

Choose from last used Logger List: Use to connect to a logger on a Logger List

Disconnect: Quickly disconnect from either direct connection or a telephone connection

Toggle Connection Window: Use to turn on and off the connection status window at the bottom of the screen

Setup PC: Quickly access PC setup configurations

Create Graph: Create a graph from an open data file

UnZoom Graph: Use to back out of an expanded graph

Cancel COMM OP: Cancel the current communication operation

About: Opens the ELOG Manual

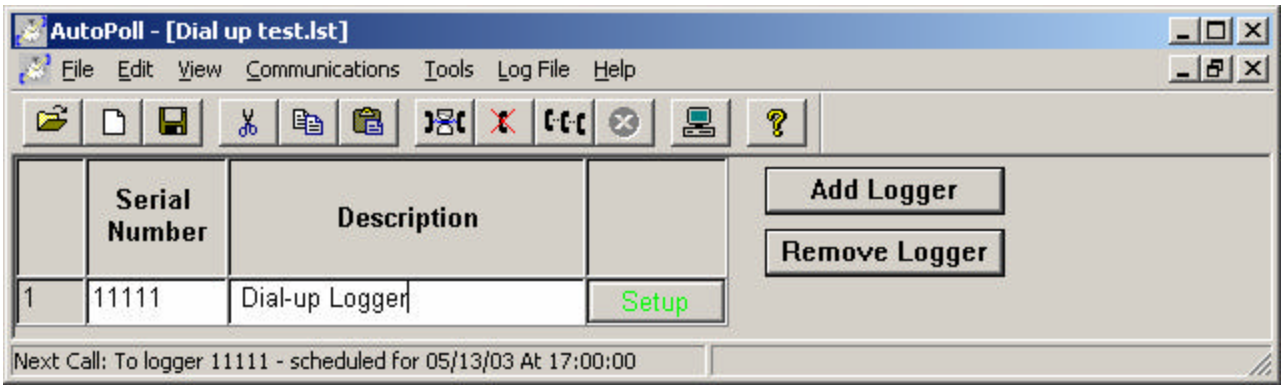
NOTE: *The number and type of hot buttons in the toolbar depend on the windows that are open. For example, the* *(UnZoom Graph) button will only appear when a graph is open.*

AUTOPOLL: UNATTENDED CALLING FROM THE PC TO THE LOGGER

When ELOG is installed onto the PC, two other programs are also installed: AutoPoll and AutoHost. AutoPoll may be used for unattended and automatic data retrieval from a number of remote loggers where the PC calls the loggers. AutoHost (described in the next section) may also be used for unattended and automatic data retrieval from a number of remote loggers where the loggers call the PC.

AutoPoll (short for *Auto*matic *Poll*ing) is a stand-alone Windows application program that may be launched from ELOG by using the **Logger; Communication; AutoPoll…** menu command. AutoPoll works in conjunction with a *Logger List*, which is a compilation of the remote loggers to be interrogated, their modem telephone numbers, call schedule, and other tasks to be performed. A complete description of Logger Lists is found below.

AutoPoll has limited user interaction and should be thought of primarily as an automatic dialer. After launching AutoPoll, you are prompted to first select a Logger List containing the loggers that you wish to call. Only one Logger List may be active at a time. After selecting the desired Logger List, a screen similar to the one below becomes the active window.



At this point, the AutoPoll program is running and may be minimized by clicking on the button. AutoPoll will run in the background and you may continue to use the PC for any other tasks during the day. AutoPoll does seize the modem and modem port. While AutoPoll is running, you will not be able to use the modem for other programs such as e-mail or the internet.

File

Typical Windows commands are found in this menu item.

New Ctrl+N Opens a New Logger List: groups of loggers used with the AutoPoll. Logger List files have a .lst extension.

Open… Ctrl+O The **Open** function is very similar to the **New** command except it assumes that a Logger List is already stored somewhere on the computer disk.

Save Ctrl+S and **Save As…** These functions allow you to save an open Logger List using the current name and location (**Save**) or with a new name and/or to a new location on the PC hard disk (**Save As**).

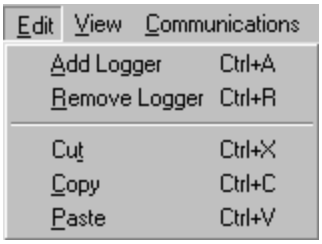
Print **Ctrl+P** Is used to initiate printing and to select the pages to be printed. Print Setup may also be accessed from this menu.

Print Preview Allows you to view the document to be printed as it will appear on the paper.

Print Setup… Is used to select the printer to be used, paper tray source, and paper orientation.

Exit Exits and closes the AutoPoll program.

Edit

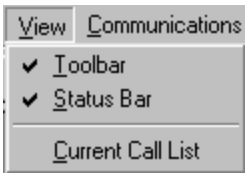


Add Logger **Ctrl+A** Adds a new logger to a logger list

Remove Logger **Ctrl+R** Removes an existing logger from a logger list

Cut **Ctrl+X**, **Copy** **Ctrl+C**, **Paste** **Ctrl+V** Standard Windows commands.

View



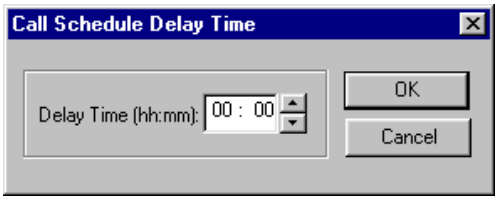
View is used to toggle the **Toolbar** and **Status Bar** on or off as desired. The Toolbar contains the hot buttons and the Status Bar is the line at the bottom of the screen that reports the callout status.

The Current Call List is the active Logger List that is being used by AutoPoll to schedule calls to loggers. The logger list may be closed and hidden but is still active in AutoPoll until a new logger list is opened, replacing the current list.

Communications

Delay Today's Calls: Is used to *temporarily* change the time calls are to be made. If the window is minimized, AutoPoll operates in the background and the computer may be used for other purposes at the same time AutoPoll is running. Sometimes it may be desired to use the computer modem for another purpose (e.g., retrieving e-mail). To lock out AutoPoll so that it does not interfere with other uses of the modem, use Delay Today's Calls... to delay all scheduled calls for the day for up to 24 hours.

To use, click on the buttons to select the length of the delay and then click **Ok**. When the delay period has passed, any loggers that had been scheduled during the delay period will then be immediately called.



Cancel Today's Calls: This feature deletes all calls scheduled for the day and they are *NOT* called later.

Repeat Today's Calls: This function allows all loggers on the day's call list to be recalled. This feature would be useful if, for example, the telephone cord was not connected to the modem when the calls were attempted and, consequently, no data retrieval took place. Repeat Today's Calls makes it easy to call all of the loggers again.

Terminate Current Call: This menu item will cancel a call in process.

> ***TECH TIP:*** *You may also cancel any operation, including a data retrieval by clicking on the Cancel Communication Operation (Cancel COMM Op) hot button.*

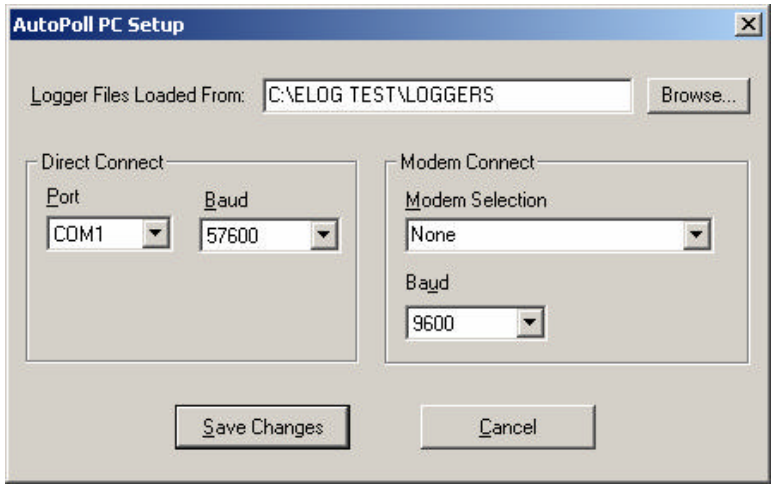
Tools; PC Setup

PC Setup is used to set parameters related to the computer including port settings, baud rates and more.

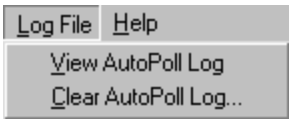
Clicking on **PC Setup** brings up the following screen:

The default folder from which Logger Lists may be selected is set here.

The com (communication) **Port** that the PC will look to for both direct serial and modem communication, the communication speed (**Baud**) are also set here.



Log File



View AutoPoll Log: When the AutoPoll program calls loggers, it creates a text file that contains a summary of all of the calls made called the AutoPoll Log. An excerpt of Log is shown below:

```
 - DENT Instruments -

AutoPoll Event Log File

Connecting to logger ELITE on 04/10/02 at 10:54:31
Direct connection to logger ELITE completed
Setting clock from 10:54:36 04/10/02 to 10:54:38 04/10/02 for logger ELITE
Task complete for call to logger ELITE
Downloading data for logger ELITE
Download of data from logger ELITE completed. Appended to file ELITE-01.dat
All session calls completed  -  1 Calls Attempted  -  0 Calls Failed

----------------------------------------

Connecting to logger ELITE on 04/10/02 at 11:08:01
Direct connection to logger ELITE completed
Setting clock from 11:08:07 04/10/02 to 11:08:08 04/10/02 for logger ELITE
Task complete for call to logger ELITE
Downloading data for logger ELITE
Download of data from logger ELITE completed. Appended to file ELITE-01.dat
All session calls completed  -  2 Calls Attempted  -  0 Calls Failed

----------------------------------------
```

At the end of each call, a dashed line is added to the bottom of the file to separate calling sessions.

The file created shows the status of each call (and attempted call) made to the logger(s) in the Logger List and includes changes made to the logger clock if the *Set Logger Clock* flag has been checked in the Logger List. At the end of the session, a summary of the calls attempted and failed will be shown. If the software took three attempts to contact a logger and was successful on the third try, the summary would still show 1 Call Attempted - 0 Calls Failed.

The file created is labeled autopoll.log and is automatically saved to whatever folder contains the ELOG application program (typically C:\Program files\Dent\Elog). The folder where the file is saved may not be changed except by moving the ELOG application too.

As subsequent polling sessions are completed, the autopoll.log file is automatically updated and the new contact reports are appended to the existing .log file. The maximum size of the autopoll.log file is 1 Megabyte. If this limit is exceeded, AutoPoll automatically changes the existing .log file into a .bak and starts a new .log file. If there is already an existing autopoll.bak file, the existing file is deleted and replaced by the new autopoll.bak file.

Autopoll.log is a text format document (.txt) and may be opened by a word processor or any application that reads ASCII files from which it may then be viewed or printed.

Delete AutoPoll Log: Can be used to clear the current call log. Caution: Once cleared the call log information cannot be retrieved.

Logger Lists

Logger Lists are used to maintain information about groups of loggers (the lists) related to telephone communication, including the telephone number of the logger modem and a schedule of calls to be made to the logger by the host computer. This information can be used for manual connecting and by the AutoPoll program. A Logger List may have as few as one logger in it or as many as a disk space on the computer allows.

Logger Lists are accessed through the **File; Open** (or **New**)**; Logger List File** command. Selecting **Open** will bring up a folder from which to select an existing Logger List to edit or use. Selecting **New** will bring up a blank Logger List as shown below:

where;

Serial Number is the 5 digit logger serial number. If the serial number entered here does not match the serial number of the logger called at the phone number listed, the data will be retrieved but an error will be noted in the Call Log.

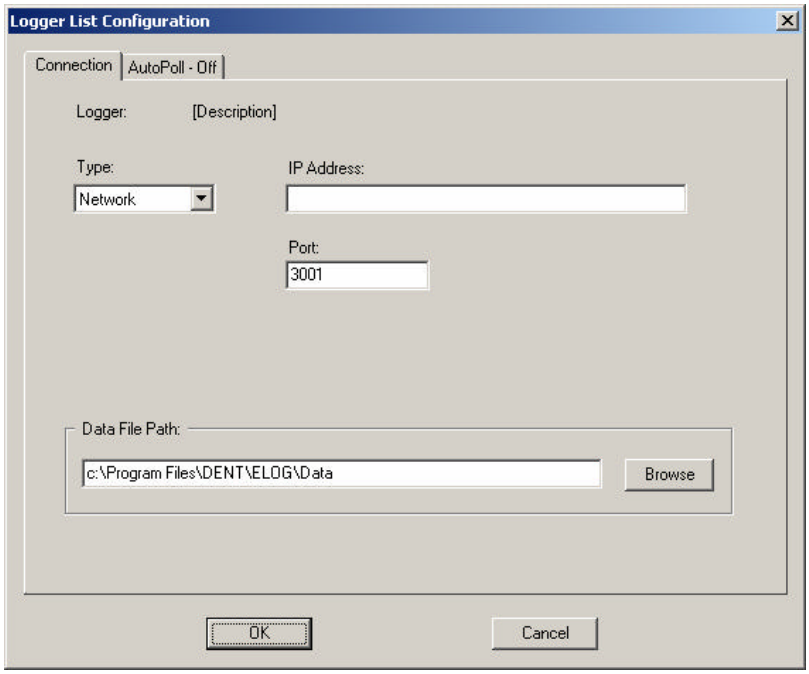
Description (optional) is a 20 character description of the load monitored

Setup is where additional information about connecting to the logger is kept.

Add Logger is used to add a new, blank line at the bottom of the Logger List to create new entries for additional loggers.

Remove Logger is used to remove a logger from the list. To remove a logger place the mouse cursor over the number in the left-most column of the logger to be removed. Left click the mouse to highlight the logger and then click Remove Logger.

Clicking on Setup for a logger brings up the following screen:



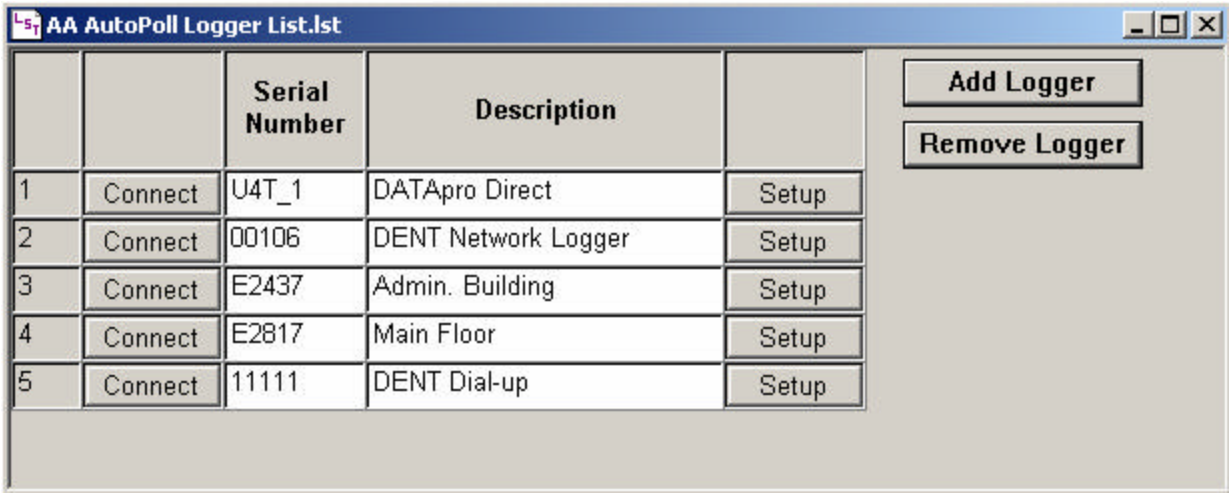
Connection Tab

The default connection type is Network. If the logger is to be used on a network enter the IP Address and Port Number assigned to the logger.

If the logger is not connected to a network, click the **Type:** down arrow to change the connection method to Direct (Serial) or Telephone (Modem). For Direct connection set the logger baud rate (default is 57600) and PC COM port (default is COM 1) to be used. For Telephone connection, select the baud rate (default is 9600 baud) and enter the telephone number of the logger modem.

Data File Path: (optional) is the location of the folder where data files retrieved from the logger will be saved. This field is advisory only. The actual data file "save-to" path used by AutoPoll is set in Tools; PC Setup.

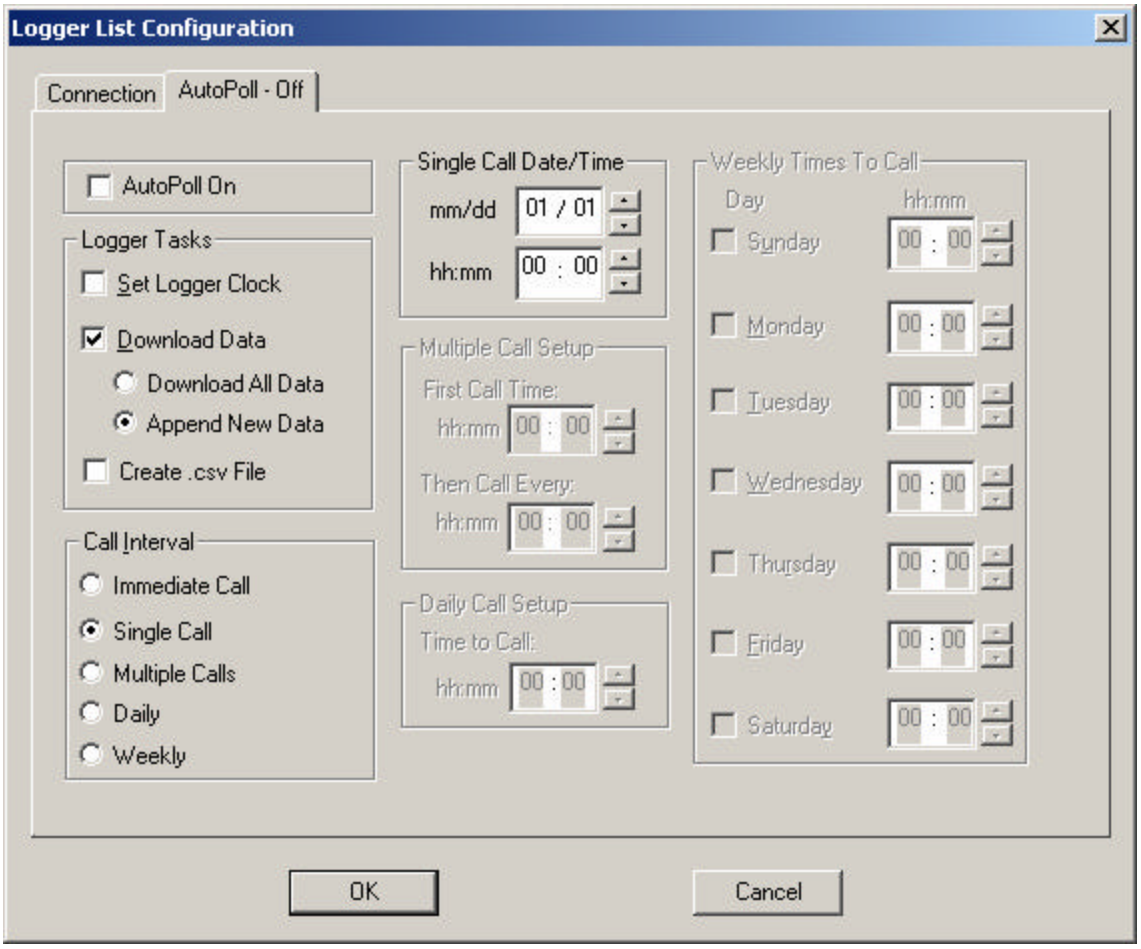
An example completed Logger List for five loggers may look as below:


AA AutoPoll Logger List.lst
Serial Number
Description
Add Logger
Remove Logger
1 Connect U4T_1 DATApro Direct Setup
2 Connect 00106 DENT Network Logger Setup
3 Connect E2437 Admin. Building Setup
4 Connect E2817 Main Floor Setup
5 Connect 11111 DENT Dial-up Setup

AutoPoll Tab

When a Logger List is to be used by the AutoPoll program for automatic, unattended data retrieval, the serial number should be entered and the connection method selected on the Connection tab of the Setup section. The Data File Path should also be completed.

A Call Schedule must also be defined for each logger in the list which is done by clicking on the AutoPoll tab which brings up the following default call scheduler:



The default call schedule is a Single Call on January 1st at 00:00 (Midnight). When the PC calls the logger, only the "new" data in the logger stored since the last data download will be retrieved.

Logger Tasks

Set Logger Clock—If the *Set Logger Clock* box is checked then, after the PC calls the logger and the data download is complete, the PC will set the logger clock to the PC time.

Download Data—Data retrieval may be one of two options: Download All Data or Append New Data. Append New Data is used for on-going metering projects and only data collected and stored in the logger since the last download is retrieved. The new data is appended to the existing data file.

> ***NOTE:*** *When appending a data file, AutoPoll looks in the data folder specified in the Tools: PC Setup for that logger. If the data file has been moved or this is the first time the logger has been read and Append New Data is checked, then AutoPoll will download the entire memory of the logger*.

Create .csv File—If it is desired to have the downloaded data also be created in a Comma Separated Variable format to allow use in other applications such as Excel, check this box. Creating a .csv does not affect original .dat file downloaded from the logger.

Call Interval

Five choices are available for automatic polling and data retrieval however, only one Call Interval may be selected at a time. The choices are:

Immediate Call—Calls the logger as soon as the AutoPoll program is initiated. Use this to test the system after completing a logger installation to verify correct operation.

Single Call—Use this option to make a one-time call and data retrieval from a logger. Use the Single Call Date/Time box to set the month and day (mm/dd), and hour and minute (hh:mm) the call is to be made.

Multiple Calls—Use this option to make multiple calls to a logger in the same day. The First Call Time is when AutoPoll first calls the logger. AutoPoll then calls the logger at the interval set in: Then Call Every. The time of the first call happens on the first day that the call out time is encountered *after* the Logger List has been saved.

Daily Call—Use this option to call the logger every day at the same time. Use the Daily Time To Call box to set the hour and minute (hh:mm) that the call is to be made.

Weekly Call—Use this option to configure the host computer to call the logger on one or more days every week. Use the Weekly Times To Call box to select the days and the hour (hh) and minute (mm) the calls are to be made. Only one call per day is permitted but they can be at different times on different days.

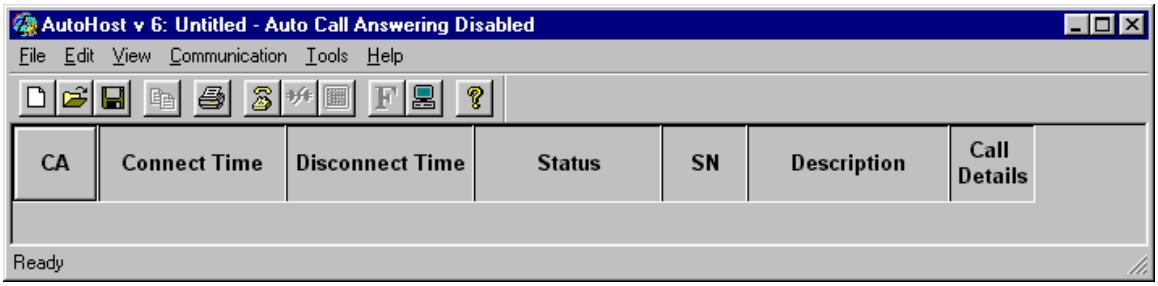
NOTE: *To set any of the times (days or months) use the mouse to select the field to be changed and then click on the* *arrows to change to the desired value.*

AUTOHOST: UNATTENDED, LOGGER INITIATED CALLS TO THE PC

ELITE*pro* and **DATA***pro* loggers equipped with modems can be configured to automatically *initiate* telephone data retrieval sessions (AutoHost, short for *Auto*matic PC *Host*), as well as answer calls from the PC (AutoPoll). The AutoHost configuration function in ELOG allows storing in the logger a call-out schedule, task list and telephone number for the logger to call. At the time(s) specified in the configuration table stored in the logger, the logger will call a host computer at the telephone number stored in the logger. If the computer has the application AutoHost running (the AutoHost application is launched from the Logger; Communication; AutoHost menu), then the computer will answer the call and perform the data retrieval tasks programmed into the logger.

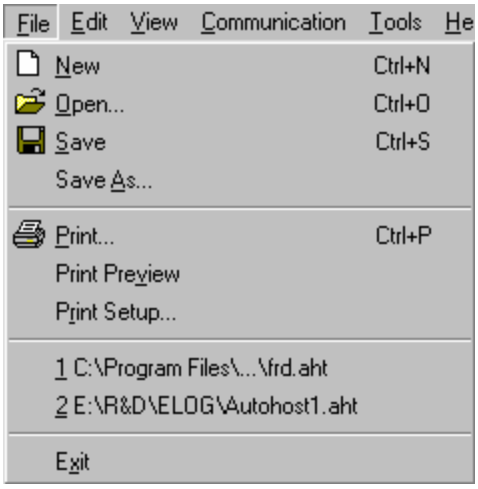
AutoHost is most useful when a dedicated telephone line for the logger is not available and a customer's telephone line must be shared. In such cases it is common for the logger to call out to a toll-free number that connects to the computer where AutoHost is running.

Launching AutoHost brings up the following screen:



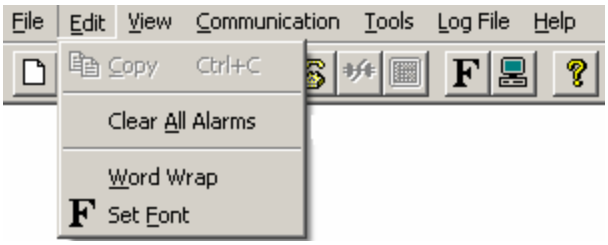
The menu commands are described next.

File



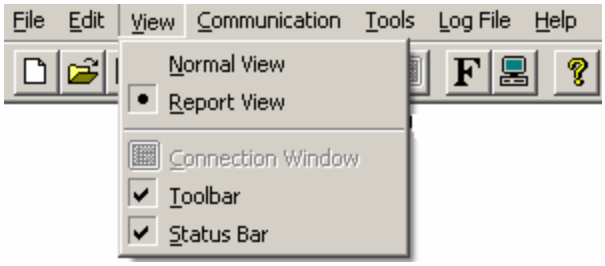
File is used for standard Windows operations for opening, saving and printing files. In this case, File refers to an AutoHost file which is the report generated when a logger calls the host PC. AutoHost files have a ".aht" extension.

Edit



Edit is used with an AutoHost report file. Use **Clear All Alarms** to turn off any alarm conditions that may have been reported by a logger that had an alarm set point exceeded. **Word Wrap** and **Set Font** are available only when in **Report View** format as described in **View** below.

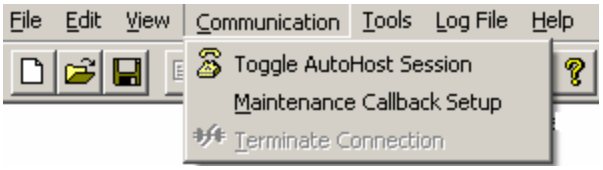
View



Normal View and **Report View** toggle the presentation of the connection report file (.aht). Normal View provides a style of report with one-line summaries of the each logger's call to the PC. Report View is a running text presentation of the complete connection report.

Toolbar and **Status Bar** toggle on and off viewing the hot buttons (Toolbar) and the connection window at the bottom of the screen (Status Bar).

Communication



Toggle AutoHost Session: Sometimes it is desirable to disable AutoHost temporarily, such as to use the PC modem for other purposes. To disable AutoHost, click on this menu item.

Maintenance Callback Setup: Sometimes it is desirable to have the logger call the host computer at a time other than that set in its callout schedule. For example, loggers may be set to call in the middle of the night to save money on long distance telephone charges. Perhaps it is desirable to have a specific logger call the next day at 12:00 (noon, as in the screen above) to view the channel values in real-time. In the Maintenance Callback area enter the serial number of the logger you wish to have call you, then check the Request Callback box, and enter a time and telephone number for the logger to call. When the logger calls in for its next scheduled data download, AutoHost will send the callback command, time to make the call and telephone number to call to the logger. The next time that the callback time occurs (later the same day or the next day), the logger will call the designated number. If the designated time of day to callback has passed, the logger will callback at the requested time on the next day.

If ELOG is open (*not AutoHost*) when the logger calls back and the Maintenance Callback Mode is set to ON (in the Logger; Communication menu), then ELOG will answer the call and connect just like a normal modem connection. At that point, the user will be able to interact with the logger and use all of the ELOG commands including viewing data in real-time, changing Setup Tables or callout schedules.

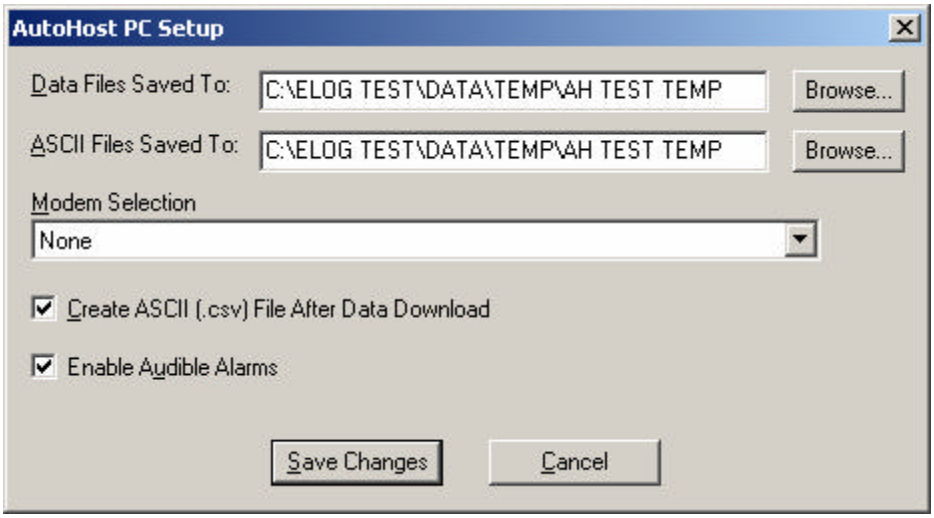
At the end of the ELOG session, use the ELOG menu command: **Logger; AutoHost Configuration; Retrieve AutoHost Configuration** to call up the AutoHost Call Schedule Configuration in the logger. Check the box: **Resume original callback schedule** to return the logger to its normal callout schedule. If the logger fails to connect with ELOG or if the Resume original callback schedule box in the AutoHost Configuration has not been checked, the normal callout schedule will be suspended and the logger will continue to call back every day at the Maintenance Callback time.

> ***Note:*** *The callback can be scheduled for any time of day and the call will only occur when that time next occurs.*

Terminate Connection: This function is used to end a call from a logger while it is in process.

Tools

PC Setup is used to set various default parameters related to the connection. Selecting this menu item brings up the following dialog box:



Data Files Saved To: Allows the user to set the default data folder to which data files will be sent when downloaded from the logger

ASCII Files Saved To: Data files may also be retrieved in a flat file (.csv-comma separated variable format) as described below. The ASCII files may be saved to a folder different than where the binary files are saved.

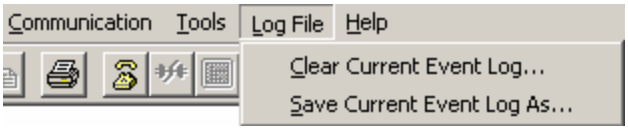
Modem Selection: Windows 95 and higher allows the user to select from multiple modems for communication. The default is **None** and, with that selection, AutoHost will use the first modem it finds to answer the logger's call.

Create ASCII (.csv) File After Data Download: Sometimes it is desirable to have the logger data files be in an ASCII format for use by other programs (e.g., Excel, Access, Lotus). By checking this box, a comma separated variable (.CSV) ASCII file is created and saved *in addition* to the usual .dat binary file.

Enable Audible Alarms: If the alarm capability of the logger is used it will normally trigger an audible alarm in the PC when the data is downloaded. The audio alarm is in addition to the flashing red text that also appears on the computer screen. To disable the audio part of the alarm only, check this box.

Log File

When AutoHost answers incoming calls from the remote loggers it keeps a record of the calls and their success or failures together with details

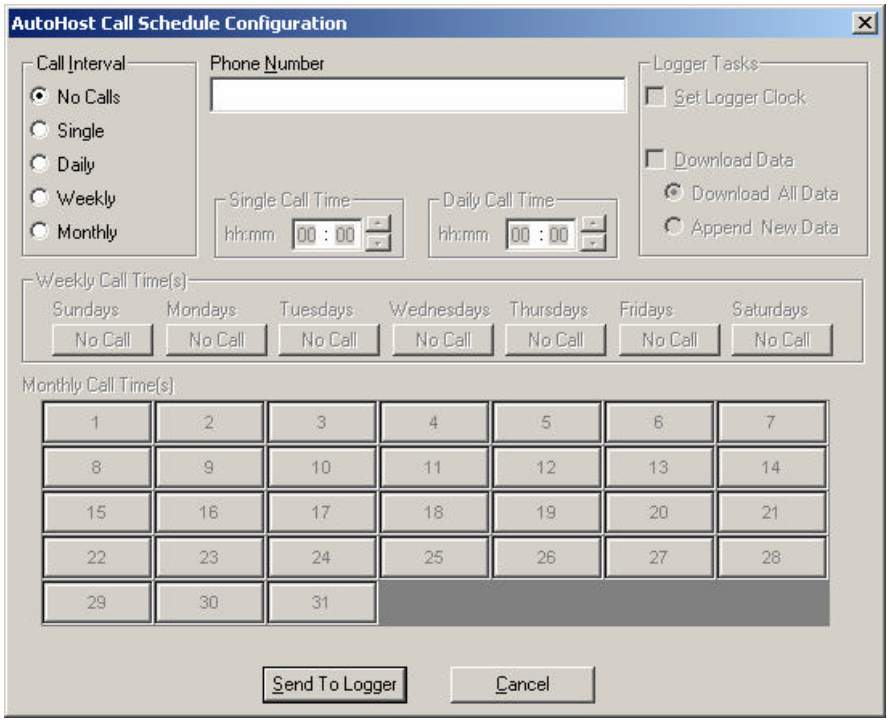


about the calls. This call log file is stored on the PC with a .aht file extension. When a .aht call log is open, it may be cleared (deleted) or saved for future use.

Using AutoHost

First, connect a logger to the serial port of a PC using ELOG and the Logger; Communication; Direct Connect command. Then use AutoHost Configuration; Send AutoHost Configuration (*or* Retrieve AutoHost Configuration) to call up a configuration table to edit. Using Retrieve will call up the AutoHost configuration already in the logger. Using Send will call up a blank configuration if Retrieve has not already been used. If Retrieve has been used in the current ELOG session, then the AutoHost configuration shown will be the one brought from the logger.

A blank configuration is shown below:

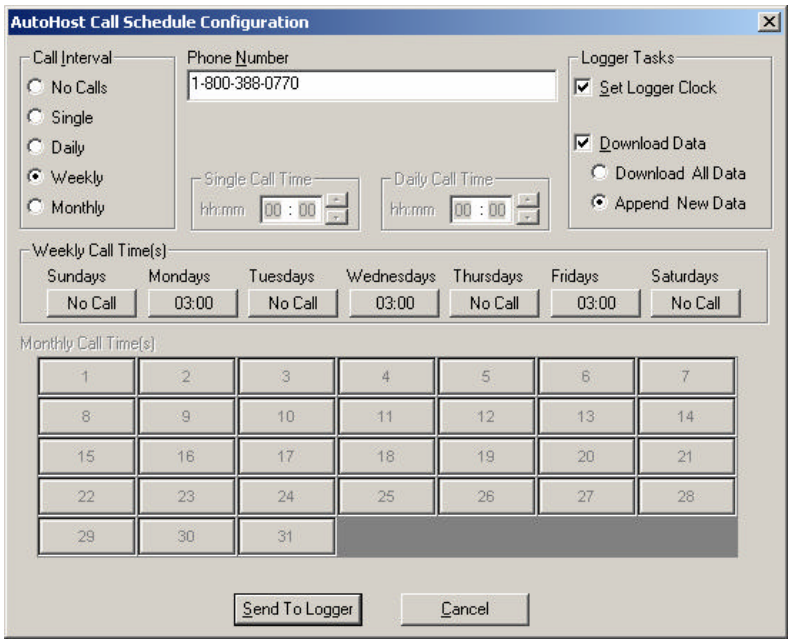


With an AutoHost configuration on the screen, you may change the configuration table as desired. Use the Send To Logger button to send the changed table back to the logger. The configuration table must have set, as a minimum, the telephone number of the host computer to call, a call time, and a task (set clock and/or download data).

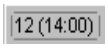
There are two data download options. The first, **Download All Data**, sends all the stored data in the logger to the PC. The second option, **Append New Data**, sends only the data that the logger has collected since the last time the logger was read by the host computer. In this instance, the new data (since last download) is appended to the existing data file that has already been retrieved from the logger. If the logger cannot find an existing data file to append to, it will default to a complete data download.

NOTE: *Since AutoHost configuration tables are not stored on the PC, you must be connected to a logger to use the AutoHost Configuration command.*

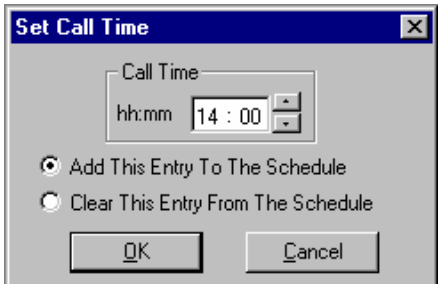
An example callout schedule is shown below. The call interval has been set to Weekly and the logger makes a toll-free call to a host computer at the number 1-800-388-0770. According to the example schedule, the logger will call *every* Monday, Wednesday and Friday at 03:00. Upon connection with the AutoHost program, the host computer is instructed to update the logger clock to the PC clock and download all new data in the logger. New data means data collected and stored in the logger since the last time the logger memory was read.



The default Call Interval is No Calls. The logger can also be set to make only one call to the host (Single Call Interval) or every day (Daily Call Interval). The calling on a monthly basis is set by choosing Monthly in the Call Interval box. At that point, the Monthly Call Time(s) window becomes active and a call time for a day(s) of the month is selected by using the mouse to click on the day(s) that a call is to be made. A window similar to the one below appears:

After clicking **Ok**, the day of month button changes to 

where the first number is the day of the month (12th) and the second number in the parentheses is the time of day that the logger will call the host computer (14:00).



NOTE: *Regardless of the Call Interval specified, there can be only one call-out time per day.*

After creating the AutoHost Configuration file, it must be sent to the logger. Do this by clicking on the Send To Logger button. Lastly, use *Logger; Communication; AutoHost…* to launch the AutoHost program. The AutoHost program must be running for the computer to answer calls from the loggers.

TECH TIP: *AutoHost Configurations are not saved by the software. Instead, a configuration table may be retrieved from a logger, edited and then resent to the logger. The configuration settings remain active in the computer until ELOG is closed. The active configuration settings may be downloaded to any number of loggers to accelerate setting up the loggers for automatic calling of the host computer.*

ELITE*pro*™:
CONNECTING SENSORS AND CONFIGURING CHANNELS

Power Measurement: The **ELITE***pro* can monitor AC power loads ranging from single phase-two wire to 3 phase-4 wire systems and up to 600 VAC at either 50 or 60 Hz.

1. Use the proper Current Transformers (CTs) for the load being monitored. For a complete discussion on this, see the section *Current Transformer (CT) Selection* below.
2. *Caution: Do not use unshunted CTs, only use shunted CTs* with 333mV AC output. *A serious shock hazard and damage to a Logger can result from unshunted CTs*.
3. Always point the arrow on the CT *towards* the load or as otherwise indicated on the CT. All diagrams in this section will show the CT phasing arrow pointing towards the load.
4. *Always connect the white neutral wire to the neutral bus bar if available or to the L2 or L3 phase if metering a 3 Phase, 3 Wire system with no neutral.*

READ ALL WARNING SYMBOLS DESCRIBED IN THE SAFETY SECTION AT THE BEGINNING OF THIS MANUAL.

Warning: Use of this device in a manner for which it is not intended may impair its means of protection. **Do not exceed 600 VAC into voltage inputs!**

When connecting the **ELITE***pro* to an AC load, follow these steps in sequence to prevent a shock hazard:

1. Connect the CTs to the appropriate channels on the **ELITE***pro*.
2. Connect the CTs to the phases being monitored.
3. If equipped with the external wall charger power supply, connect it next.
4. Connect the voltage leads in this sequence: If equipped with a **GROUND (green) wire connect it first, then NEUTRAL (white or as marked).** Then connect the other remaining three phase wires in any order.

Logger Wiring Label Conventions:

When connecting the voltage wires to the AC line, the following wire colors should be used for the different phases:

U.S./ Canada	**International**
A Phase (black)	L1 Phase (black wire with "L1" label)
B Phase (red)	L2 Phase (black wire with "L2" label)
C Phase (blue)	L3 Phase (black wire with "L3" label)
Neutral (white)	Neutral (black wire with "N" label)
Ground (green)*	Ground or Earth (green wire)*

*The Ground (green) wire is not found on **ELITE***pros* manufactured after 12/98.

NOTE: The U.S. & Canada color conventions are used in the diagrams that follow.

Current Transformer (CT) Selection:

Proper CT selection is critical for accurate results. Use CTs with the smallest diameter to fit around the wire(s), and whose rated amperage is not less than 100% of the largest load expected.

In general (but not always, check with the factory), solid core CTs have better accuracy than split core CTs. Also, best CT accuracy will result when the load operates *as close to the full rating* of the CT as possible. Do not use CTs that greatly exceed the maximum load of the item being monitored.

The following is a list of some of the most common CTs available:

Common CT Sizes

Small Split Core 0.75" (19 mm)	*Medium Split Core* 1.25" (32 mm)	*Large Split Core* 2" (51 mm)	*Clamp-On* (various sizes)
5A	100A	600A	150A
50A	200A	1000A	500A
100A	400A		1000A
	600A		

Flexible CTs with Current Ranges from 300A to 6000A are also available for large bus bar or large wire bundle monitoring

All of the above CTs are available from DENT Instruments. These are shunted CTs (333mV output) which make them safe to handle even when connected to an energized wire. Also, they are case-insulated for 600V phase-to-phase service. Do not use on services with higher voltages.

Caution: Do not use unshunted CTs, only use shunted CTs (333mV AC output). A serious shock hazard and damage can occur if unshunted CTs are used.

CT Selection Examples

The following are example scenarios for selecting the proper CT:

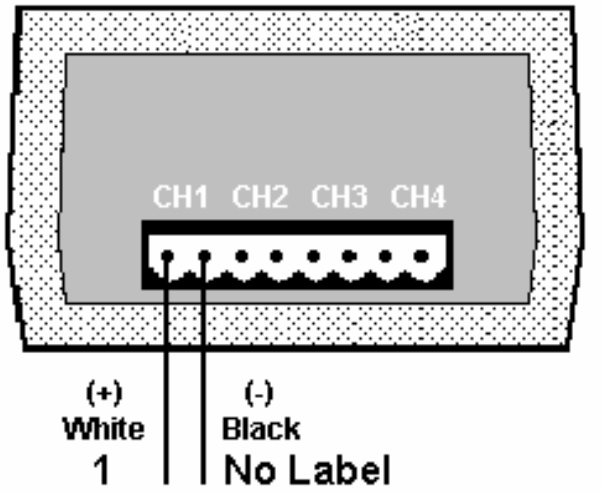
1. A single phase motor with a 20 amp breaker (rated as 10 amps running load) with #12 wire. In this scenario, use a 15 or 30 amp split core or 150 clamp-on.
2. Four lighting circuits, #12 wires with 20 amp breakers. When all lights are on, the amperage measures 45 amps. In this scenario, use a 50 amp CT.
3. A single heating circuit, with a 2/0 conductor and a 60 amp breaker. In this scenario, use a 70 or 100 amp CT.

TECH TIP: *If a utility already has a meter with a 5A secondary CT(s) connected to a load being monitored, you may connect a 5A split core CT around the output (secondary) of the utility's CT. To calculate the CT value to be used in the Logger setup table, multiply the utility CT ratio by the* **ELITE***pro* *CT size (e.g. if the utility CT is 4000:5 and the ELITE Logger CT is 50A use (4000/5) x 50 = 40,000 for the value of the CT in the logger Setup Table.*

Connecting CTs and Configuring Channels: Examples

The next section will show how to connect the CTs and the voltage taps to different service types, and how to configure the logger channel(s) for monitoring.

ELITE*pros* made after 12/98 use CTs with stripped and tinned, bare terminated wires. The CT leads need to be connected to the green Phoenix termination block as shown in the diagram below:



CT Lead Markings

For each channel, the left connector pin is the positive or high-side wire and the right pin is the negative or low-side. When using DENT Instrument supplied current transformers, connect them as follows:

Split-core CTs (removable leg)—The white CT wire is (+) and the black wire is (-)

Clamp-on CTs (clothes pin type)—The banded wire with a number one (1) is the (+) wire and the unbanded wire is (-)

NOTE: Correct polarity is required to insure proper phasing of the CT.

After connecting the CTs to the green connector block, apply the CTs to the phases being monitored. Be careful to observe proper CT orientation. If an arrow is shown on the CT label it should be pointed towards the load. Otherwise, use the instructions printed on the CT (For example, "This Side Toward Load").

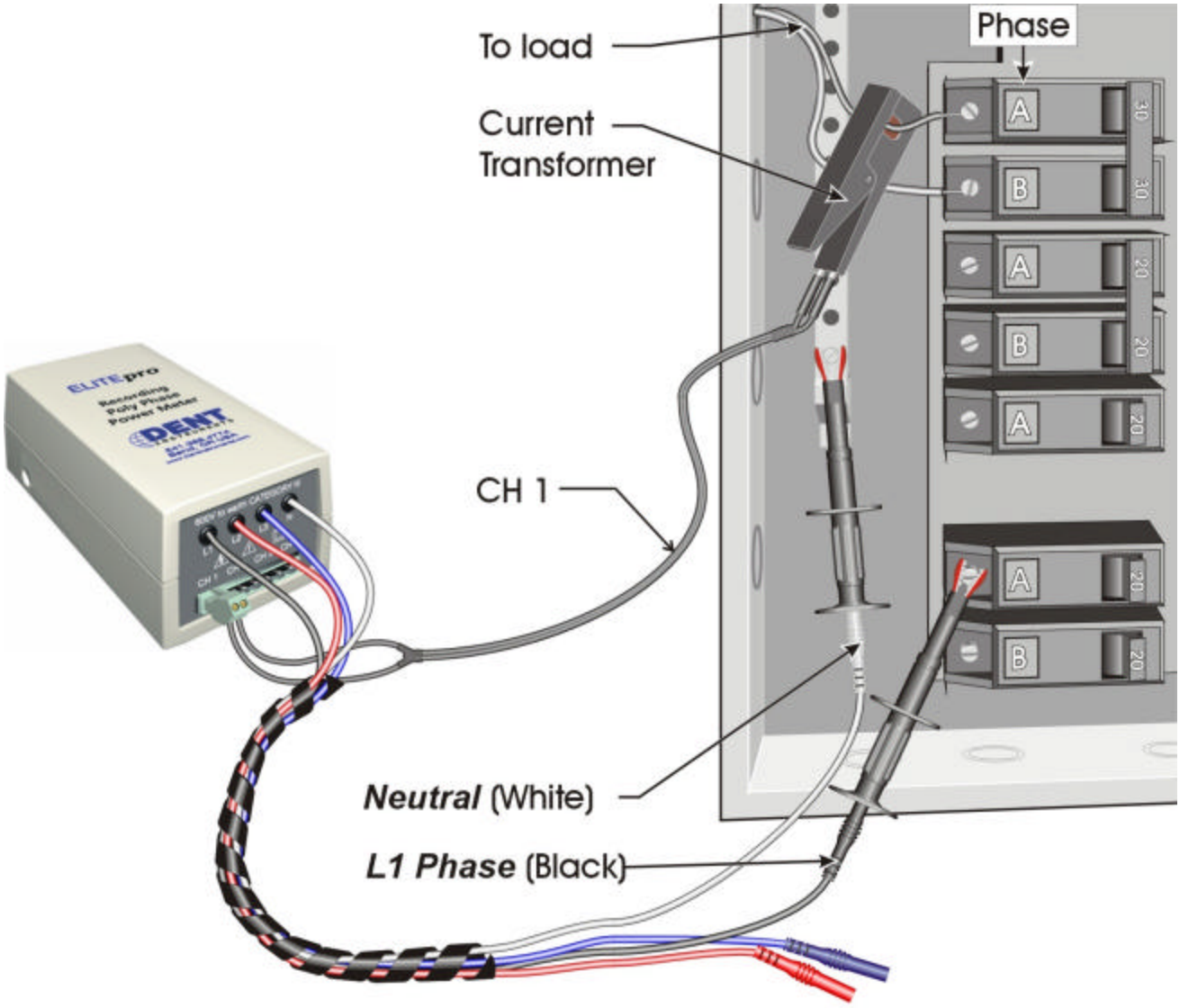
If the **ELITE***pro* is equipped with an external wall transformer, connect it next.

Lastly, connect the voltage leads to the different phases. Connect the Neutral wire first, then the remaining voltage sense (phase) wires.

ELITE*pro*™ *Logger:*

Single Phase, 2 Wire Power Measurements

The **ELITE***pro* can monitor up to four Single Phase, 2 wire AC loads.



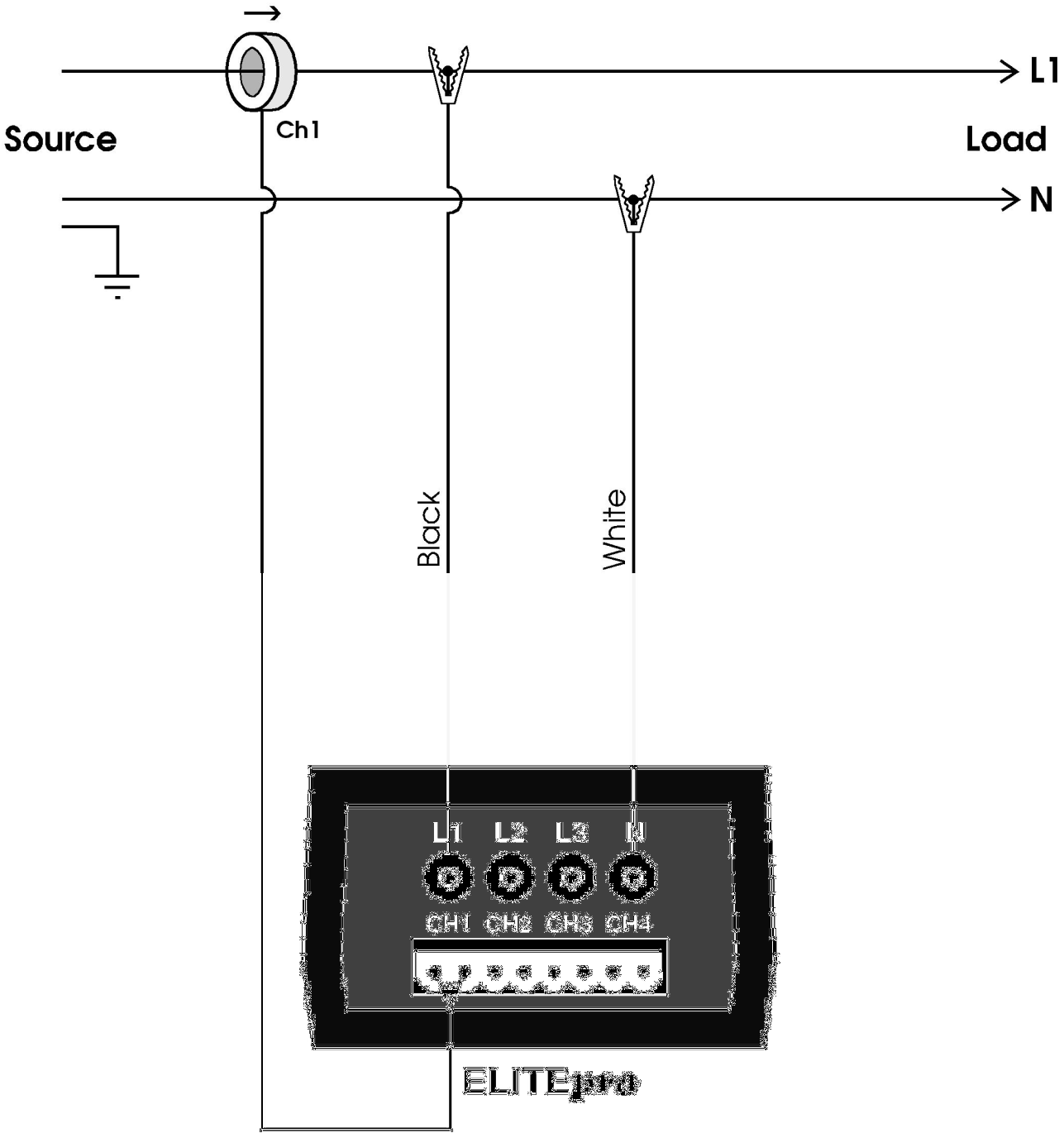
Configure Channel 1 in the Setup Table as follows:

Channel 1	Name	VHi	VLo	PT	CT	Volts	Amps
Power	Single Phase 2 Wire	L1	N	1.0000	100.00*		

*This value should correspond to the actual rating of the selected CT.

ELITE*pro*™ *Logger:*

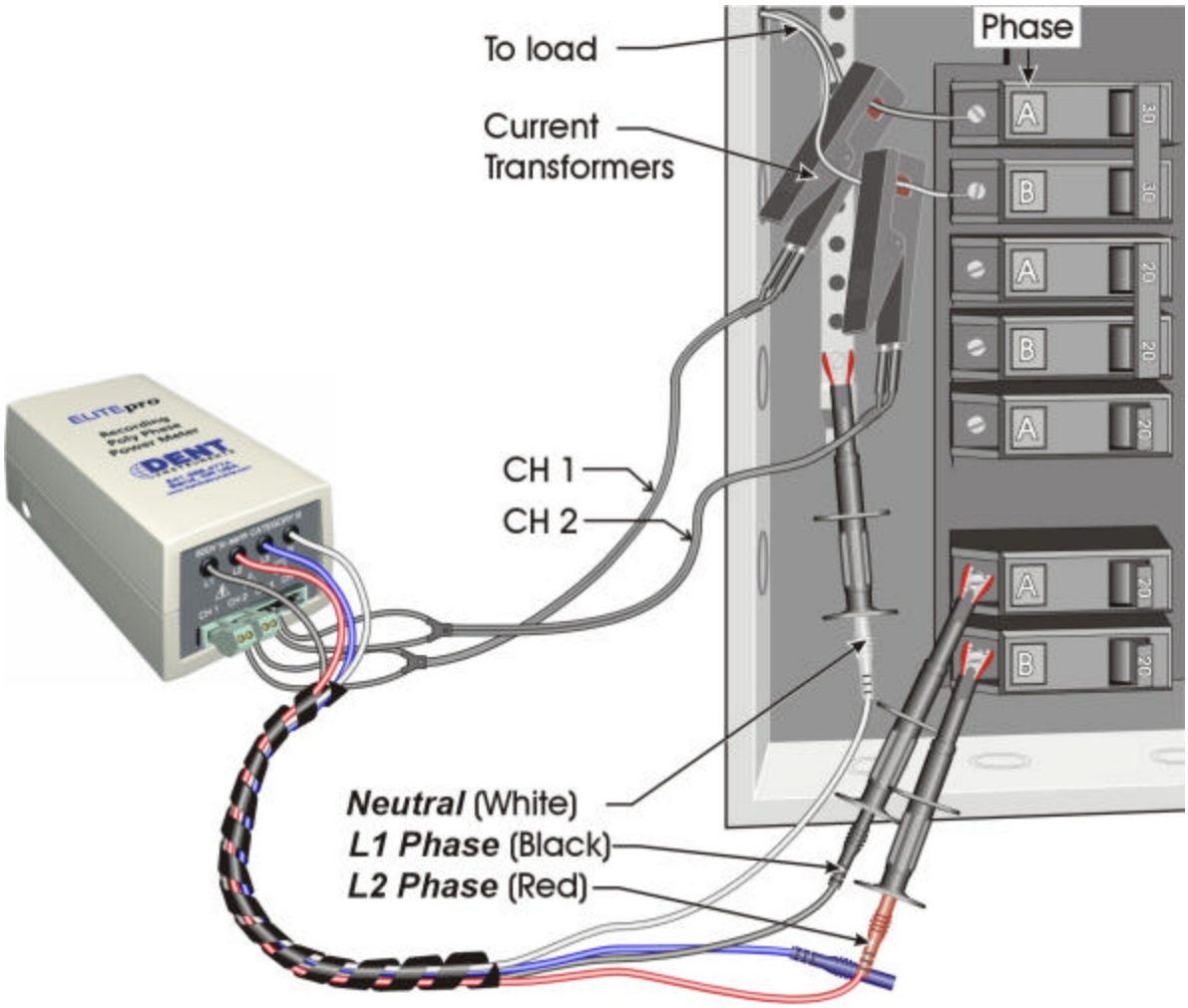
Wiring Diagram for Single Phase, 2 Wire



Note: At the CT connection on the Logger, the left pin of the connector is the CT High side (+) and the right side is the CT low side (-).

ELITE*pro*™ *Logger:*
Single Phase, 3 Wire Power Measurements

The **ELITE***pro* can monitor up to two Single Phase-3 Wire AC Loads.



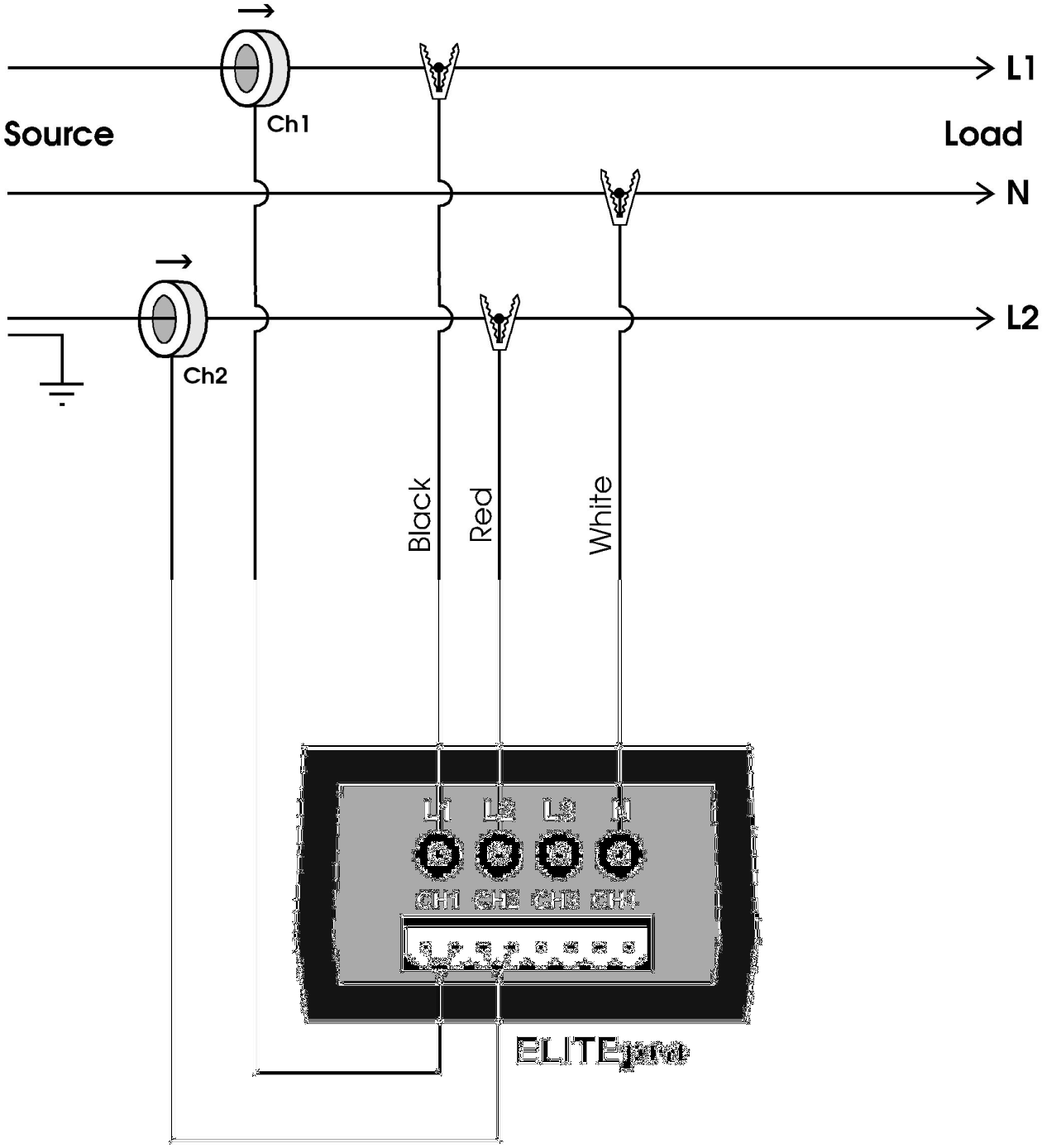
Configure the channels in the Setup Table as follows:

Channel 1	Name	VHi	VLo	PT	CT	Volts	Amps	K
Power	Single Phase 3 Wire	L1	N	1.0000	100.0*			
Channel 2	Name	VHi	VLo	PT	CT	Volts	Amps	K
Power	Single Phase 3 Wire	L2	N	1.0000	100.0*			
Channel 3								
Off								
Channel 4								
Off								
Channel 5	Name		Combine Channels			Volts	Amps	K
Power Sum	Optional		1,2					

*These values should correspond to the actual rating of the selected CTs.

ELITE*pro*™ *Logger:*

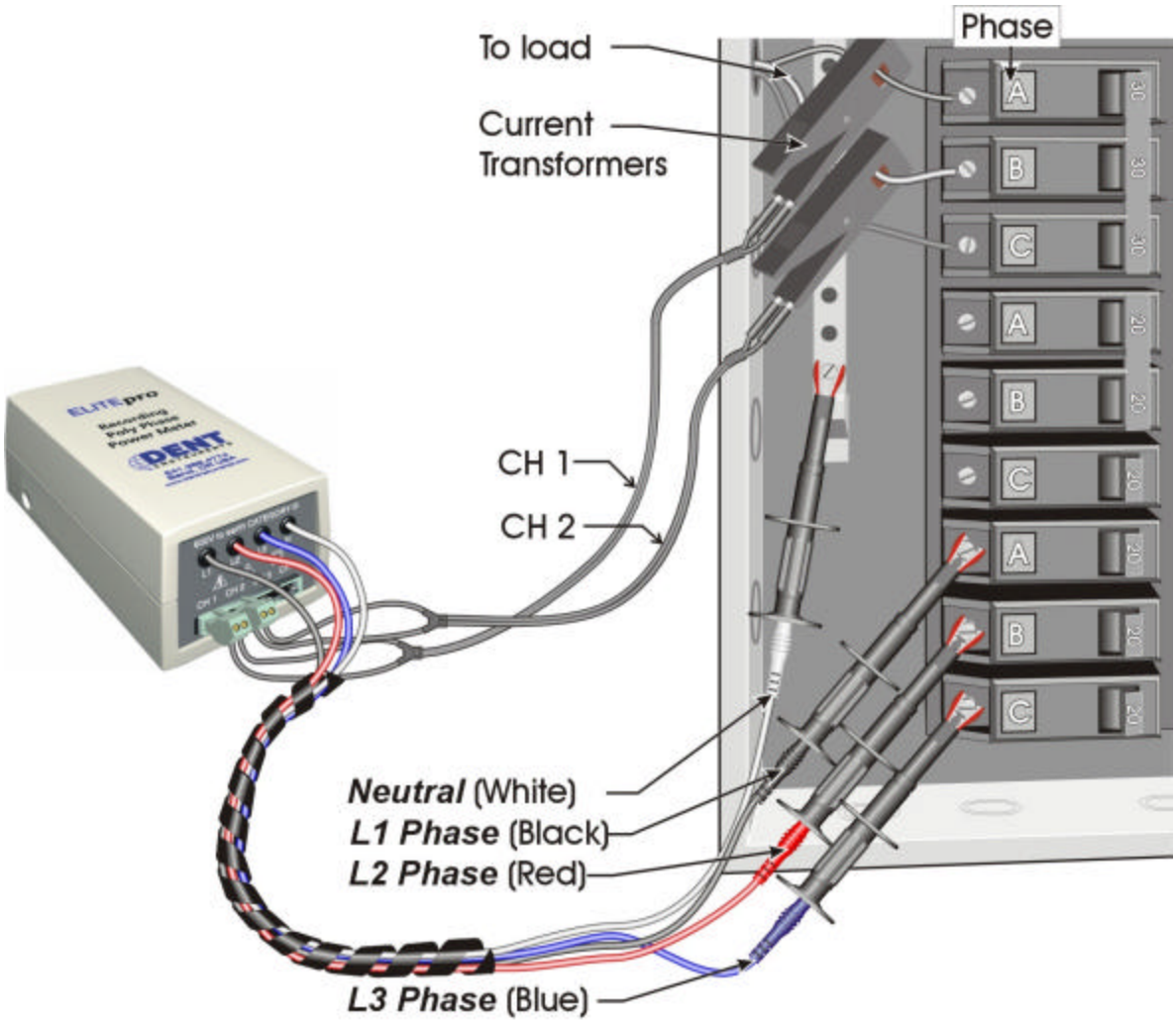
Wiring Diagram: Single Phase, 3 Wire



Note: At the CT connection on the Logger, the left pin of the connector is the CT High side (+) and the right side is the CT low side (-).

ELITE*pro*™ *Logger:*
3 Phase, 3 Wire (DELTA) Power Measurements

The **ELITE***pro* can monitor up to two 3-Phase, 3 Wire DELTA loads.



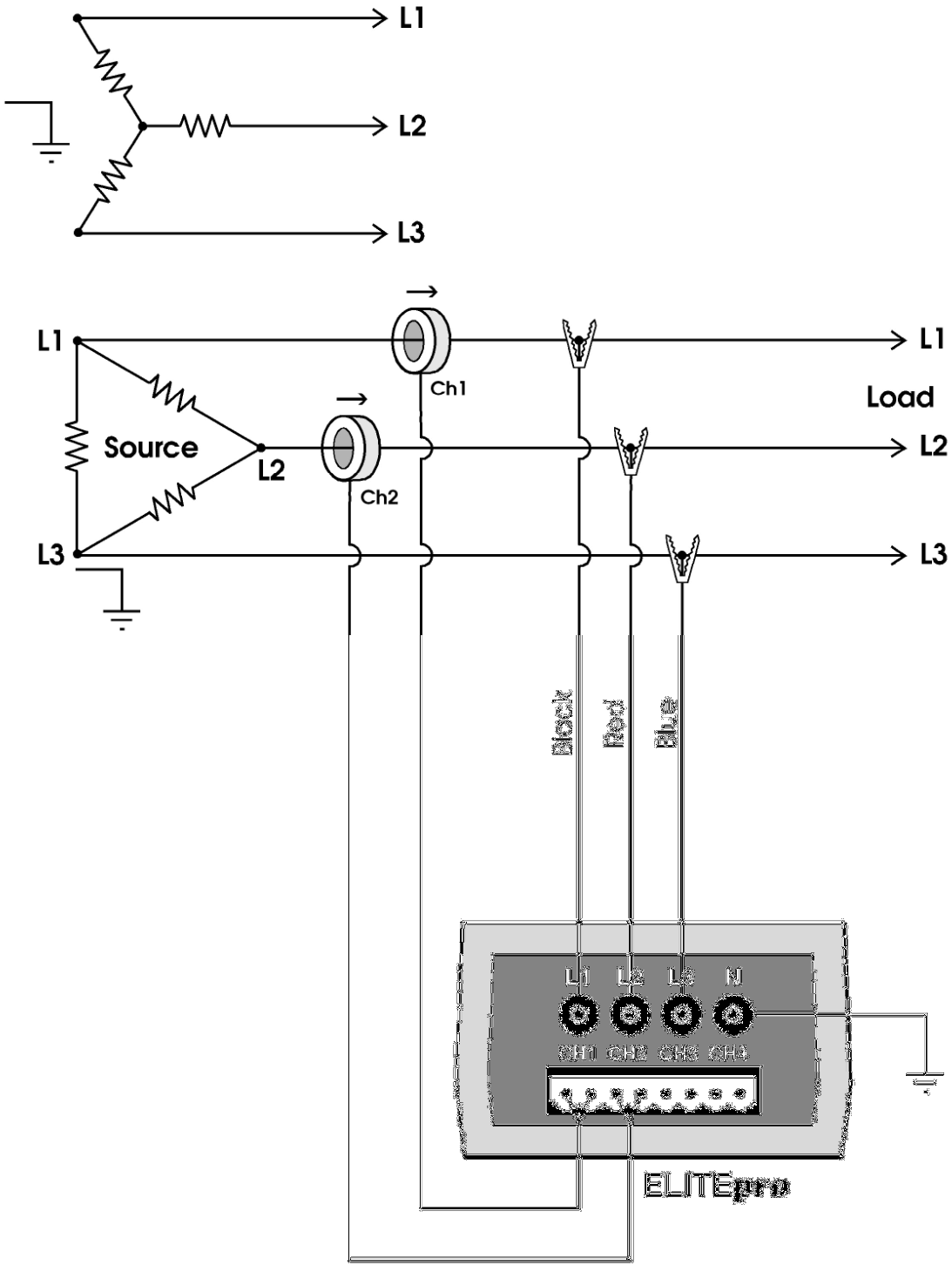
Configure the channels in the Setup Table as follows:

Channel 1	Name	VHi	VLo	PT	CT	Volts	Amps	K
Power	3 Phase 3 Wire	L1	L3	1.0000	100.0*			
Channel 2	Name	VHi	VLo	PT	CT	Volts	Amps	K
Power	3 Phase 3 Wire	L2	L3	1.0000	100.0*			
Channel 3								
Off								
Channel 4								
Off								
Channel 5	Name		Combine Channels			Volts	Amps	K
Power Sum	Optional		1,2					

*These values should correspond to the actual ratings of the selected CTs.

ELITE*pro*™ *Logger:*

Wiring Diagram: Three Phase, 3 Wire

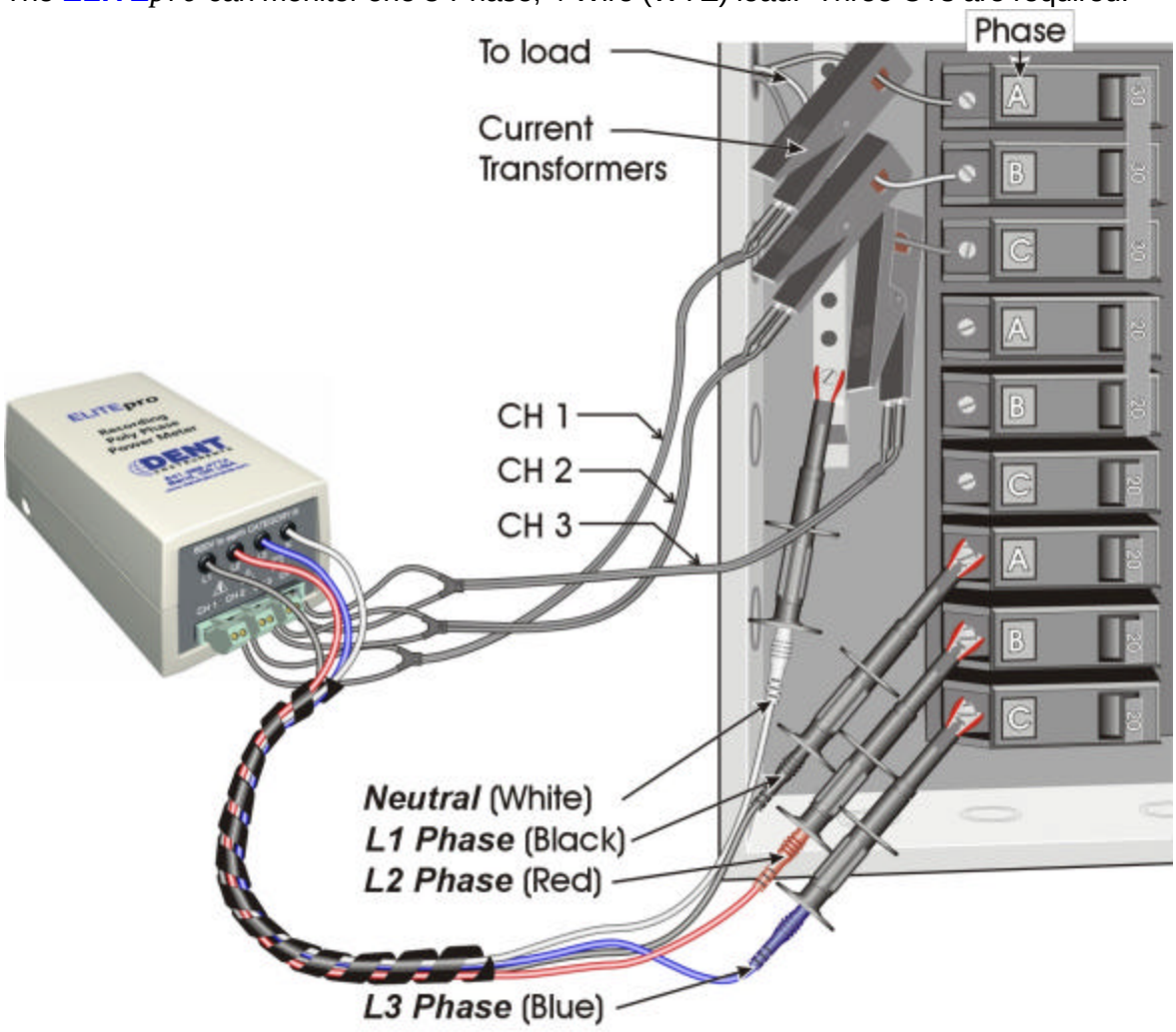


Note: At the CT connection on the Logger, the left pin of the connector is the CT High side (+) and the right side is the CT low side (-).

ELITE*pro*™ *Logger:*

3 Phase, 4 Wire WYE Power Measurements

The **ELITE*pro*** can monitor one 3-Phase, 4 Wire (WYE) load. Three CTs are required.



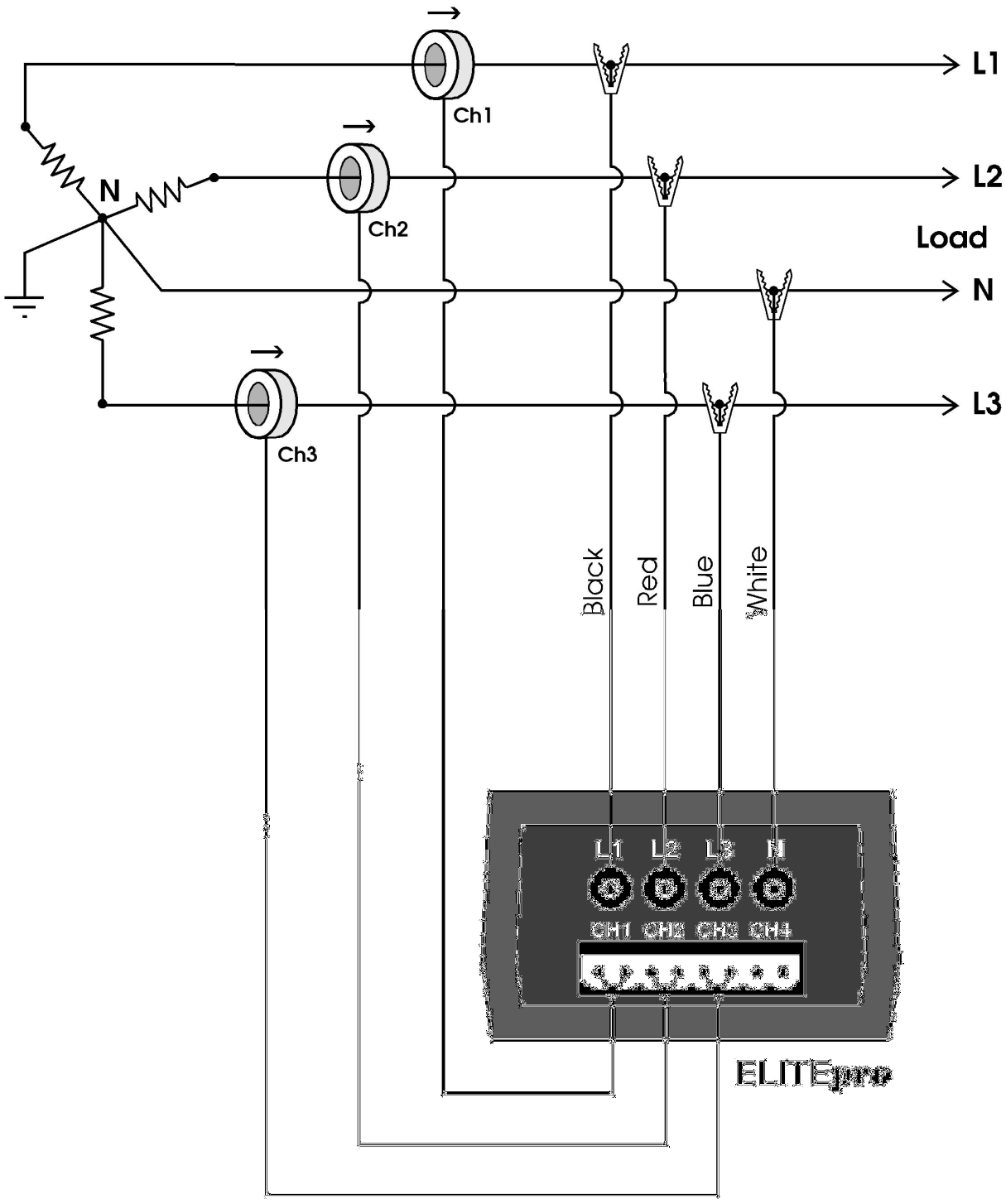
Configure the channels in the Setup Table as follows:

Channel 1	Name	VHi	VLo	PT	CT	Volts	Amps	K
Power	3 Phase 4 Wire L1-N	L1	N	1.0000	100.0*			
Channel 2	Name	VHi	VLo	PT	CT	Volts	Amps	K
Power	3 Phae 4 Wire L2-N	L2	N	1.0000	100.0*			
Channel 3	Name	VHi	VLo	PT	CT	Volts	Amps	K
Power	3 Phase 4 Wire L3-N	L3	N	1.0000	100.0*			
Channel 4								
Off								
Channel 5	Name			Combine Channels		Volts	Amps	K
Power Sum	(Optional) Total			1,2,3				

*These values should correspond to the actual rating of the selected CTs.

ELITE*pro*™ *Logger:*

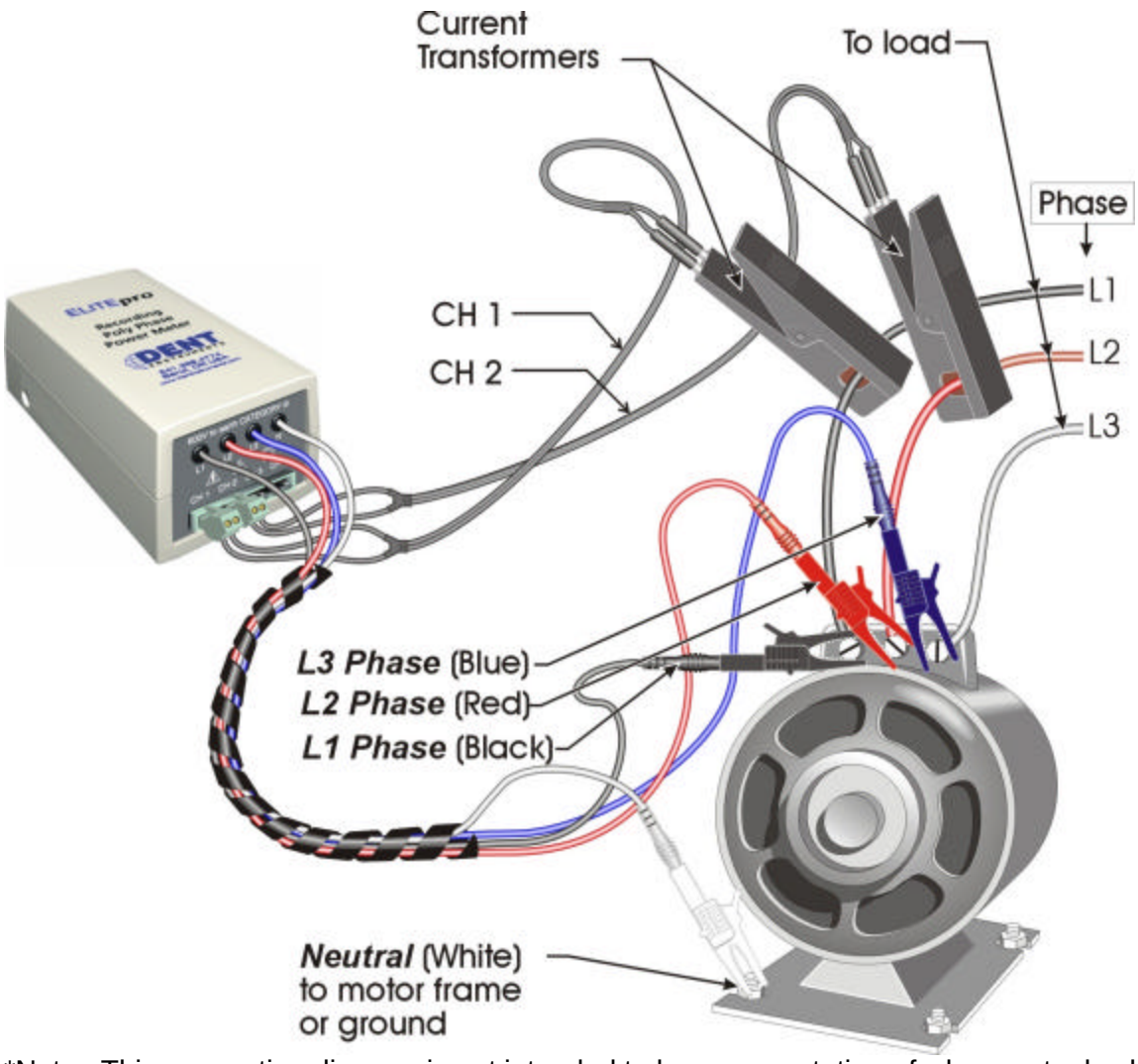
Wiring Diagram: Three Phase, 4 Wire WYE



Note: At the CT connection on the Logger, the left pin of the connector is the CT High side (+) and the right side is the CT low side (-).

ELITE*pro*TM *Logger:*

Monitoring a Three Phase (Delta) Motor*



*Note: This connection diagram is not intended to be representative of where actual voltage and CT connections are to be made.

Configure the channels in the Setup Table as follows:

Channel 1	Name	VHi	VLo	PT	CT	Volts	Amps	KW
Power	Motor L1-L3	L1	L3	1.0000	100.0*			H
Channel 2	Name	VHi	VLo	PT	CT	Volts	Amps	KW
Power	Motor L2-L3	L2	L3	1.0000	100.0*			H
Channel 3								
Off								
Channel 4								
Off								
Channel 5	Name		Combine Channels			Volts	Amps	KW
Power Sum	Motor Total		1,2					H

***These values should correspond to the actual ratings of the selected CTs.

POWER SUM EQUATIONS USED BY THE ELITE*pro*™ LOGGER

Channels 5 and 6 (in the software and in the **ELITE***pro*) are called *Power Summation Channels.* They can be configured to sum the data from 2 or more power channels. The Power Sum Channels are often used to calculate total device power parameters or total building power parameters for 3 phase services but they may also be used to sum together multiple single phase loads as well.

The power summation channels can also be used to ***optimize*** the memory of the **ELITE***pro*. Instead of collecting data from two (or more) separate channels, the power summation channel(s) can be configured to collect and sum the data from multiple channels.

Channel 5 *automatically* appears in the Setup Table on the computer screen when 2 or more power channels are turned "on." When 3 or 4 power channels are turned "on," channel 6 also *automatically* appears in the Setup Table.

> ***TECH TIP:*** *If only 1 power channel is turned on in a Setup Table, then channels 5 and 6 will* ***not*** *appear. If 2 power channels are turned on, then only channel 5 will appear. If 3 or 4 power channels are turned on, then channels 5 and 6 will appear.*

THREE PHASE POWER SUM EQUATIONS

3-Wire Delta Systems — 2 Watt-Element Method

Channel 5 Values:

SYSTEM VOLTS = (CH1 VOLTS + CH2 VOLTS) / 2

SYSTEM AMPS = CH1 AMPS + CH2 AMPS

SYSTEM VARS = CH1 VARS + CH2 VARS

SYSTEM WATTS= CH1 WATTS + CH2 WATTS

SYSTEM VOLT-AMPS = $\sqrt{(\text{CH 1 VARS} + \text{CH2 VARS})^2 + (\text{CH1 WATTS} + \text{CH2 WATTS})^2}$

SYSTEM POWER FACTOR = $\frac{\text{SYSTEM W}}{\text{SYSTEM VA}}$ "Displacement Power Factor"

See also the Application Note: Using The 3 Watt-Element (3 CT) Method On A 3-Wire DELTA Service.

Positive (+), "lagging" Power Factor is typical for an inductive load
Negative (-), "leading" Power Factor is typical for a capacitive load

> ***TECH TIP:*** *Because only two channels are needed to monitor a three phase—three wire load, then two such loads can be monitored simultaneously by the ELITEpro as long as the voltage references are the same.*

4-Wire WYE Systems **3 Watt-Element Method**

Channel 5 Values:
SYSTEM VOLTS = (CH1 VOLTS + CH2 VOLTS + CH3 VOLTS) / 3

SYSTEM AMPS = CH1 AMPS + CH2 AMPS + CH3 AMPS

SYSTEM VARS = CH1 VARS + CH2 VARS + CH3 VARS

SYSTEM WATTS= CH1 WATTS + CH2 WATTS + CH3 WATTS

SYSTEM VOLT-AMPS = CH1 VA + CH2 VA + CH3 VA

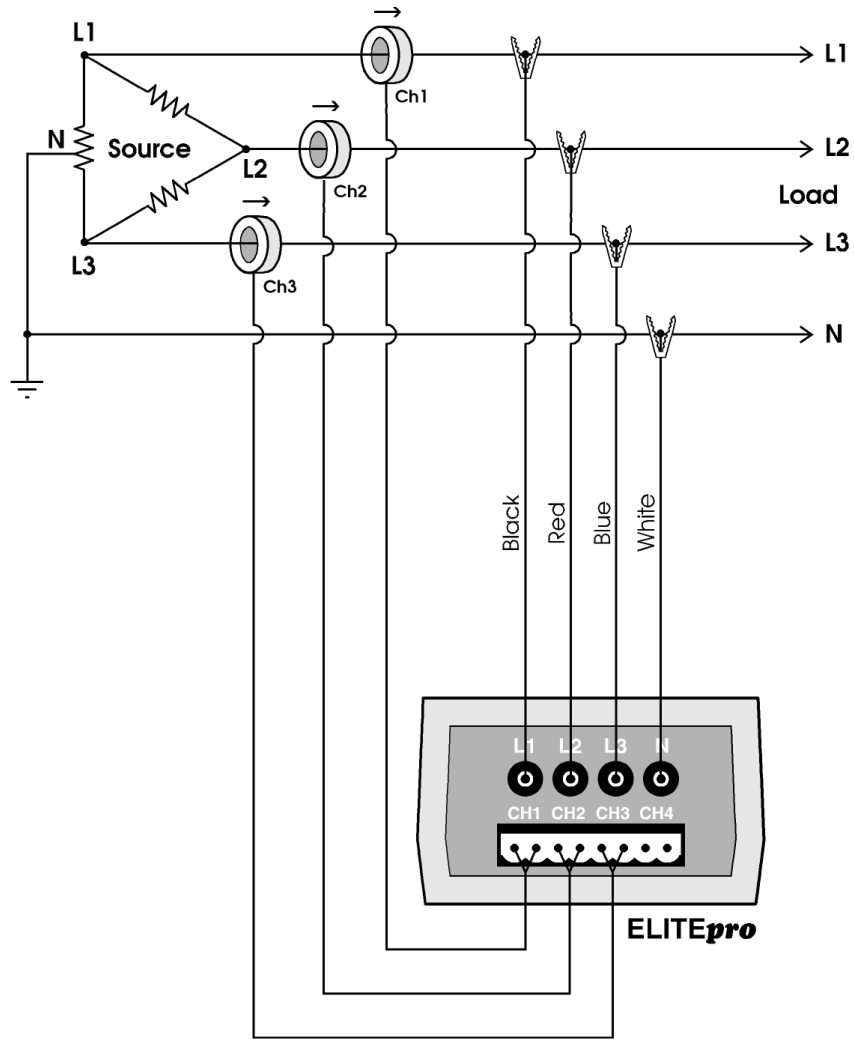
SYSTEM POWER FACTOR = $\frac{\text{SYSTEM W}}{\text{SYSTEM VA}}$ "Apparent Power Factor"

Sign of Power Factor (+ or-) = sign (SYSTEM VARs X SYSTEM WATTs)

Positive (+), "lagging" Power Factor is typical for an inductive load
Negative (-), "leading" Power Factor is typical for a capacitive load

Unusual Metering Systems

Three Phase Delta with a “Wild” (Red) Leg

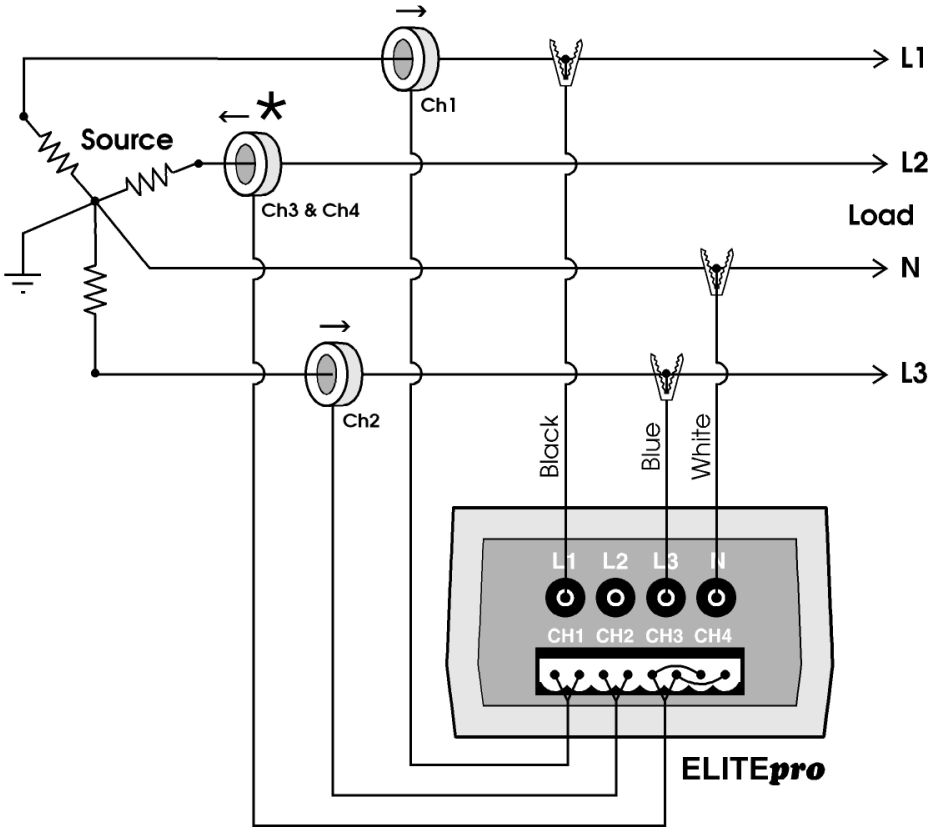


Configure the channels in the Setup Table as follows:

Channel 1	Name	VHi	VLo	PT	CT	Volts	Amps	K
Power	3 Phase 4 Wire L1-N	L1	N	1.0000	100.0*			
Channel 2	Name	VHi	VLo	PT	CT	Volts	Amps	K
Power	3 Phae 4 Wire L2-N	L2	N	1.0000	100.0*			
Channel 3	Name	VHi	VLo	PT	CT	Volts	Amps	K
Power	3 Phase 4 Wire L3-N	L3	N	1.0000	100.0*			
Channel 4								
Off								
Channel 5	Name		Combine Channels			Volts	Amps	K
Power Sum	(Optional) Total		1,2,3					

*These values should correspond to the actual rating of the selected CTs.

2 ½ Element Meters



Channel 1	Name	VHi	VLo	PT	CT	Volts	Amps	KW
Power	L1 CT	L1	N	1**	5.***			
Channel 2	Name	VHi	VLo	PT	CT	Volts	Amps	KW
Power	L3 (Not L2!) CT	L3	N	1**	5***			
Channel 3	Name	VHi	VLo	PT	CT	Volts	Amps	KW
Power	L2 CT Reversed*	L3	N	1**	5***			
Channel 4	Name	VHi	VLo	PT	CT	Volts	Amps	KW
Power	L2 CT Reversed*	L1	N	1**	5***			
Channel 5	Name		Combine Channels			Volts	Amps	KW
Power Sum	2 1/2 Element Total		1,2,3,4					A

*The CT on channel three of the ELITEpro is placed on the L2 phase and is backwards. Note that the Ch3 CT is jumpered in parallel into Ch4 of the logger.
**Since the 2 ½ Element method is often used on high voltage metering, a PT ratio other than one is typical and should be set to whatever the actual PT ratio is.
***Set the CT value that is true for the CT connected to the ELITEpro. Again, because the 2 ½ element method is most often used in high voltage applications, there will be high voltage CTs present. Use the high-accuracy 5A CT from DENT Instruments on the existing high voltage CT secondary. The CT value used in the Setup Table should be primary rating of the high voltage CT (assuming the secondary output is 5A.)

DATA*pro*™:

CONNECTING SENSORS AND CONFIGURING CHANNELS

CURRENT MEASUREMENT (Model 4C)

The **DATA*pro* 4C** Logger can monitor up to 4 AC currents simultaneously at 50 or 60 Hz.

1. Use the proper Current Transformers (CTs) for the load being monitored. For a complete discussion on this, see the section *Current Transformer (CT) Selection* below.
2. *Caution: Do not use unshunted CTs, only use shunted CTs* with 333mV AC output. *A serious shock hazard and damage to a Logger can result from unshunted CTs*.

READ ALL WARNING SYMBOLS DESCRIBED IN THE SAFETY SECTION.

Warning: Use of this device in a manner for which it is not intended may impair its means of protection

When connecting the **DATA*pro*** to an AC load, follow these steps in sequence to prevent a shock hazard:

1. Connect the CTs to the appropriate channels on the **DATA*pro***.
2. Connect the CTs to the wires being monitored.
3. If equipped with the external wall charger power supply, connect it next.

Current Transformer (CT) Selection:

Proper CT selection is critical for accurate results. Use CTs with the smallest diameter to fit around the wire(s), and whose rated amperage is not less than 100% of the largest load expected.

In general (but not always, check with the factory), solid core CTs have better accuracy than split core CTs. Also, best CT accuracy will result when the load operates *as close to the full rating* of the CT as possible. Do not use CTs that greatly exceed the maximum load of the item being monitored.

The following is a list of some of the most common CTs available:

Common CT Sizes

Small Split Core	*Medium Split Core*	*Large Split Core*	*Clamp-On*
0.75” (19 mm)	1.25” (32 mm)	2” (51 mm)	(various sizes)
5A	100A	600A	150A
100A	200A	1000A	500A
	400A		1000A
	600A		

Flexible CTs with Current Ranges from 300A to 6000A are also available for large bus bar or large wire bundle monitoring

All of the above CTs are available from DENT Instruments. These are shunted CTs (333mV output) which make them safe to handle even when connected to an energized wire. They are case-insulated for 600V phase-to-phase service. Do not use on services with higher voltages.

Caution: Do not use unshunted CTs, only use shunted CTs (333mV AC output). A serious shock hazard and damage can occur if an installed, unshunted CT is handled.

CT Selection Examples

The following are example scenarios for selecting the proper CT:

1. A single phase motor with a 20 amp breaker (rated as 10 amps running load) with #12 wire. In this scenario, use a 15 or 30 amp split core or 150 clamp-on.
2. Four lighting circuits, #12 wires with 20 amp breakers. When all lights are on, the amperage measures 45 amps. In this scenario, use a 50 amp CT.
3. A single heating circuit, with a 2/0 conductor and a 60 amp breaker. In this scenario, use a 70 or 100 amp CT.

TECH TIP: *If a utility already has a meter with a 5A secondary CT(s) connected to a load being monitored, you may connect a 5A split core CT around the output (secondary) of the utility’s CT. To calculate the CT value to be used in the Logger setup table, multiply the utility CT ratio by the* **DATA***pro’s CT size (e.g. if the utility CT is 4000:5 and the* **DATA***pro CT is 50A use (4000/5) x 50 = 40,000 for the value of the CT in the logger Setup Table.*

Connecting CTs and Configuring Channels: Examples

The next section will show how to connect the CTs and the voltage taps to different service types, and how to configure the logger channel(s) for monitoring.

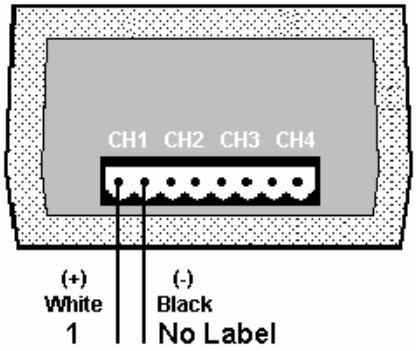
DATA*pros* made after 12/98 use CTs with stripped and tinned, bare terminated wires. The CT leads need to be connected to the green Phoenix termination block as shown in the diagram below:

CT Lead Markings

For each channel, the left connector pin is the positive or high-side wire and the right pin is the negative or low-side. When using DENT Instruments supplied current transformers, connect them as follows:

Split-core CTs (removable leg)—The white CT wire is (+) and the black wire is (-)

Clamp-on CTs (clothes pin type)—The banded wire with a number one (1) is the (+) wire and the unbanded wire is (-)



After connecting the CTs to the green connector block, put the CTs on the phases being monitored.

If the **DATA***pro* is equipped with an external wall transformer, connect it next.

TECH TIP**: Correct polarity or phasing of the CT is not required with the **DATApro.*

TEMPERATURE MEASUREMENT (MODELS 1T/3P, 2T/2P and 4T)

All channels of the **4T**, channel 1 of the 1T/3P and channels 1 & 2 of the **2T/2P DATA*pro*** are dedicated to temperature measurement. The **DATA*pro*** uses 10 kohm NTC precision thermistors as the sensors. These sensors can be obtained from DENT Instruments in a variety of configurations with high interchangeable accuracies.

To monitor temperature, connect the sensor to an appropriate channel of the logger. The sensors are not polarized and may be connected to the channel inputs (the first two positions in the connector) in either orientation.

Extension wire may be added to the sensors to allow locating them remote from the logger. When extending the leads, always use a good splicing method (soldering is best). Outdoor splices should be done with a weatherproof cover to prevent moisture or corrosion from degrading the connection.

In the ELOG software, configure the channel in the Setup Table as follows:

Note that the desired temperature units may be selected from the **Units** menu.

Using the Slope and Offset fields

Some sensors have good repeatability but need to be calibrated using a linear model, y = ax + b where "y" is the calibrated sensor output, "x" is the raw sensor output, "a" is slope and "b" is the offset. "b" will have units of degrees and "a" will have units of degrees per ohm. Other **DATA*pro*** models with analog inputs (milliamps, dc volts) can use the slope and offset to both calibrate a sensor and convert the raw signal to engineering units.

Temperature Sensor Placement Considerations

Indoor Sensors: 4 to 5 feet (1.5 M) above the floor level on an interior wall away from direct sun heating/cooling vents and drafts. Use low traffic areas to avoid accidental contact.

Outdoor Sensors: North side of building, under eaves or overhangs, preferably in a radiation shield. Avoid locations above a roof. For long term monitoring applications (several months or more), remember that locations that are shaded at the time of sensor installation may not remain so as the sun's location in the sky changes.

When placing temperature sensors, either indoor or outdoor, one basic principle applies: *Place the sensor where the desired air temperature is the only item being monitored*, not in drafts, sunlight, by heaters, etc. For indoor monitoring, place the sensor away from drafts caused by heating or cooling systems, or appliances. Do not place in areas that are artificially heated/cooled by direct sunlight, lighting, or open doors. For outdoor monitoring, place the sensor where it won't be affected by sunlight, snow, ice, or other weather that may cause a false reading. Do not place near outside lights or exhaust vents or other areas that may artificially heat or cool the sensor.

CONTACT/PULSE INITIATING SENSORS (MODELS 1T/3P, 2T/2P and 4P)

The 1T/3P, 2T/2P and 4P **DATA***pro* Loggers are equipped to monitor digital signals from switches, relays, and pulse initiating sensors as are commonly found on electric meters, gas and water meters. The most common measurements for these types of sensors are frequency, run-time, duty cycle, and pulse counting. With the interval recording capability of the **DATA***pros*, it is easy to gather inexpensive profile data from virtually any pulse initiating meter or sensor.

Connecting Digital and Pulse Sensors: Because digital and pulse sensors are not polarized, it does not matter in what order the two wires from the sensor are connected to the logger inputs. The sensor leads should be trimmed to expose approximately 6 mm (1/4") of lead and then inserted into the green Phoenix screw connectors. Tighten the screws until the wire is held firmly but not so tight that the wires are crimped.

Using Pulse Initiating Sensors: The most common uses for pulse initiating sensors is to monitor water, gas, steam, sewer, and electric meters. A meter can be used to obtain energy (kWh) and demand (kW) information.

By selecting "**Count**" from the **Record** field on the second page of the Setup Table the number of pulses occurring during the integration period are counted. Multiply the count by the **Scale** factor converts the raw number of pulses into engineering units such as cumulative energy (kWh meters) or cumulative volume (gas and water meters).

By selecting "**Rate"** in the Record field the pulse frequency in Hertz is measured. For an electric meter this corresponds to the draw of the load (kW) or the rate of flow for gas and water meters (CFS or L/S) when multiplied by the scale factor. The stored value is the average over the integration period.

When configuring pulse channel, the scale factor should be set. The scale factor is the value of each output pulse in the units specified. For example, if you are monitoring a kWh meter with a disk constant 7.2 Watt-hours/revolution and the meter provides one pulse per revolution, the scale factor would then be 7.2 (watt-hours per pulse) and the units recorded by the **DATA***pro* would be watt-hours. Use .0072 as a scale factor to obtain kilowatt-hours.

Gas Flow Meter Example

Suppose you were monitoring a gas flow meter with the **DATA***pro* Logger. From the output specifications for the meter you determine that 1 pulse = 0.1 cubic foot.

Configure the channel in page two of the Setup Table as follows:

Using a Contact Sensor (Relay) on Loads to Characterize Run-Time

Switches and relays are often used as proxies to obtain device run-time, duty cycle, and cycling (count) information.

> **Run-Time**: This is how long the item being monitored is "on" during the integration period. It can be measured in seconds, minutes, or hours.
>
> **Duty Cycle**: The duty cycle equals the run-time during the integration period divided by the period length and is equivalent to the fraction of the integration period the switch is closed.
>
> **Count**: This is the number of switch closures or pulses counted during the integration period.

NOTE: *When configuring the channel for a contact sensor, the scale factor and* ***Units*** *are not applicable. See the following example for how to configure a contact channel.*

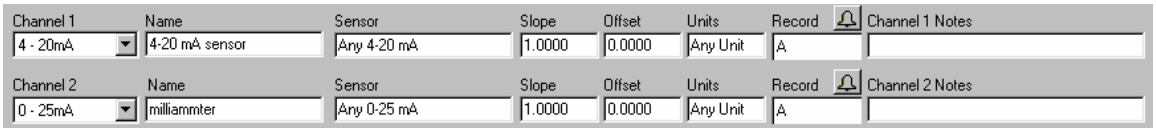
Motor Run-Time Example:

Suppose you needed run-time information from a motor. To do this, attach a relay (with a rating appropriate to the motor's operating voltage) to the motors power wires or other suitable place. Connect the **DATA***pro* Logger to the "dry" contacts of the relay (NOT the energized side of the relay).

Configure the channel to monitor Run-Time (N), Duty Cycle (D), and Count (C) as shown below.

MILLIAMP OUTPUT SENSORS (Model 4MA)

The **4MA DATA*pro*** is capable of measuring output from a large number of milliamp output sensors that are commonly used in the controls and sensing industry. This would include sensors of 4-20, 0-20 and 0-24 mA outputs.



The channels in a **4MA DATA*pro*** can be set to either 0-25 mA or 4-20mA. The difference is that with the 4-20 mA selection, the 4 mA offset is automatically removed from the stored data.

The Slope and Offset fields are used to convert the raw output of the sensor (mA) into engineering units.

Example 1: If a 4-20 mA output pressure transducer has a range of 0-100 psi. At 0 psi the sensor output is 4 mA. At 100 psi the sensor output is 20 mA. In this case, the Offset is 0 and the Slope is (100-0)/(20-4) = 6.25 psi/mA

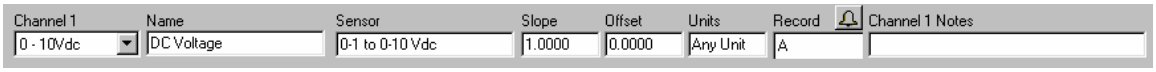
A 0-25 mA channel type could also have been selected. In that case, the slope is still (100-0)/(20-4) = 6.25 psi/mA but the Offset becomes (6.25 psi/mA * 4 mA) = -25 (psi).

Again, the 4-20 mA channel type automatically takes care of the inherent 4 mA offset for 4-20 mA sensors.

Example 2: There is a pressure gage that measures from -100 to 700 psi with a corresponding output of 4-20 mA. In this case, to convert the raw sensor output to engineering units (psi) the Offset would be -100 (psi) and the Slope would be (700-(-)100)/(20-4) = 50 psi/mA

DC VOLTAGE OUTPUT SENSORS (Model 4DC)

The **4DC DATA*pro*** is capable of measuring output from a large number of low voltage dc output sensors with an output range of 0-10 Vdc that are commonly used in the controls and sensing industry. This would include sensors with a 0-1, 0-2.5 and 0-5 Vdc output as well.



The channels in a **4DC DATA*pro*** can accurately measure any positive direct current (DC) voltage up to 10 volts.

Like the temperature and milliamp channels, the Slope and Offset fields are used to convert the raw output of the sensor (Vdc) into engineering units.

Example 1: A 0-10 Vdc output pressure transducer has a range of 0-100 psi. At 0 psi the sensor output is 0 volts. At 100 psi the sensor output is 10 volts. In this case, the Offset is 0 and the Slope is (100-0)/(10-0) = 10 psi/volt

Example 2: A 0-5 Vdc output pressure transducer has a range of 0-100 psi. At 0 psi the sensor output is 0 volts. At 100 psi the sensor output is 5 volts. In this case, the Offset is 0 and the Slope is (100-0)/(5-0) = 20 psi/volt

Example 3: A 0-10 Vdc output pressure transducer has a range of –100 to +700 psi. At -100 psi the sensor output is 0 volts. At 700 psi the sensor output is 10 volts. In this case, the Offset is -100 and the Slope is (700-(-)100)/(10-0) = 80 psi/volt

Example 4: A 0-10 Vdc output watt transducer has an output of 8 volts when measuring 150kW and 3 volts when measuring 50kW. The sensor has a linear output and it is desired that its output be measured and recorded using an **DATA*pro***. What should the Slope and Offset in the Setup Table be?

For more complex problems like this it is often helpful to draw a graph with the engineering units (kW) on the y-axis and the raw sensor output (volts DC) on the x-axis. Use the two data points to sketch a line graph to get a feel for what the slope and offset should be. Here the Slope is (y2-y1)/(x2-x1) or (150-50)/(8-3) = 20 kW/volt dc. Using either data point, the Slope and the formula for a line y = Slope*x + Offset, calculate the Offset. Offset = y – Slope*x = 150 – (20*8) = -10 kW

APPLICATION NOTES

1. USING ELITE*pros* AND DATA*pros* With USB to Serial Adapters

A growing number of laptop computers and other devices no longer have serial ports on them. Instead, the serial ports have been replaced by USB (Universal Serial Bus) ports. USB ports may be connected to ELITEpros and DATApros by using a suitable USB to Serial adapter. These may be found from a number of sources including office equipment stores such as Office Max and Staples.

To use, simply connect the adapter between the logger and the PC and connect to the logger as you normally would. We have noticed that sometimes the adapters drop or repeat characters between the logger and PC causing a communication failure. This can be minimized by using a lower baud rate. In general, use the highest baud rate that gives a reliable connection. For a direct serial connection that is almost always the maximum rate of 57,600 baud. With the USB adapter it may need to go to 28,800 or even 9,600 baud to get reliable communication. A description of changing the baud rate is found in Section 2, Tools; PC Setup.

ELOG 2002b October 20, 2002 or higher is required to use the USB adapters. Consult DENT Instruments if you have any problems.

2. USING THE 3 WATT-ELEMENT (3 CT) METHOD ON A 3-WIRE DELTA SERVICE

Using the two watt-element method on 3-phase 3-wire Delta services is a perfectly valid measurement technique. The 2-element method also uses less logger memory and hardware channels and allows measuring two Delta (3-wire) loads simultaneously. However, there are two times when it may be desirable to use the 3 watt-element method.

They are:

1. The 3-element method is more intuitive. By placing a CT on each phase wire, it is easier to understand what is happening in each phase without referring to phasor diagrams

2. Different power factor calculation. As noted in the description of the Power Sum Equations above, the System VA and, consequently, System Power Factor are calculated differently between the 2 and 3 element methods.

In 2 element measurements, Systems VA is calculated from Watts and VARs using the power triangle. In 3 element measurements, System VA is calculated as the sum of the VAs from the individual phases. Both methods are completely valid.

The major difference is how harmonics are treated. When harmonics exist, they are usually only (or mostly) present in the current and not in the voltage. Because watts and VARs are calculated as the instantaneous product of volts and amps and because an existing third or fifth harmonic current does not have a corresponding voltage harmonic, then the harmonics' products are zero. Therefore, the instantaneous product of volts and amps used to obtain watts and VARs *does not include* any harmonic component. Thus the 2-element method does not include any harmonic content in the calculation of System VA, or System Power Factor. The Power Factor calculated in this way is also known as the "Displacement Power Factor."

In 3 element systems, because System VA is calculated as the sum of the phase VAs, which in turn are the product of the rms volts multiplied by the rms amps, then harmonics *are* included (in the rms amps). The System Power Factor then also includes harmonics and is sometimes called the "Apparent Power Factor."

If there are no harmonics present, the displacement power factor and harmonic power factor are identical. If harmonics are present, the harmonic power factor (3 element) will always be smaller than the displacement power factor (2 element). Similarly, the 3-element VA will always be larger than the 2-element VA. When comparing the **ELITE***pro* three phase measurements with other meters, make sure that the same method of calculating VA and Power Factor is used.

Connecting the ELITE*pro* to a 3-phase 3-wire Delta load using the 3 element method: It is very similar to the 3-phase 4-wire WYE connection. Use a CT on each phase and connect the three **ELITE*pro*** voltage wires to each phase. The neutral wire should then be connected to earth ground. The second page of the logger Setup table should look just like that of the 4-wire WYE setup.

3. MONITORING VOLTAGES GREATER THAN 600 V:

Using the PT (Voltage Multiplier)

When monitoring loads greater than 600V (maximum rating of the **ELITE*pro***), a Voltage or Potential Transformer (PT) is required.

Use an instrument grade transformer with low phase shift and high accuracy since errors in the transformer will translate directly into errors in the recorded data. The PT value put into the Setup Table in the logger should be the transformer ratio. This feature is useful when monitoring high voltage loads such as found at a substation or on transmission lines.

Caution**: If a PT is not used on loads greater than 600V, the **ELITEpro* Logger may overheat (or worse) causing irreparable damage and extreme danger to the user*.

Determining the PT Value to be used in the Setup Table

The PT is simply the transformer ratio. For example, a potential transformer is used to monitor a 4160 VAC load. The transformer steps the voltage down from 4160 to 120 VAC. The PT equals the transformer ratio or 4160/120 = 34.667. Thus, 34.667 would be used for the PT value in the channel Setup Table.

4. Using ELITE*pros* AND DATA*pros* With External Modems

Whenever possible, DENT Instruments recommends using Internal modems with the **ELITE***pro* and **DATA***pro* Loggers. Given the large number of differences in modems the small amount of money that may be saved in using third party external modems can easily be lost in labor spent to make all of the components work together.

Because of the wide variety of modem protocols, using an external modem for remote communication requires that all four devices involved: the PC, the PC modem (local modem), Logger, and Logger modem (remote modem) must be configured correctly. They must all be set to the SAME baud rate and locked there. You may need the external logger modem manual for part of this.

From the **Logger; Communication** menu, you may call the logger one of two ways. If you know the logger modem's telephone number you may use the **Call Now (Manual Dial)…** function. Secondly, if you have added the logger to a Logger List you may use **Call Now (Choose from Logger List)…** With the Logger List open, select the desired logger with the mouse and then select **Ok** to call the logger.

Setup The PC and PC Modem: Use **Tools; PC Setup...** To set the Modem Connect Baud rate to 14400. Then from your Windows Desktop use Start; Settings; Control Panel; Modems; select your modem; Properties; Connection tab; Advanced; and turn off (un-check) Error Control and Flow Control.

Setup The Remote Logger: The Logger cannot connect faster than 14400 baud in a modem connection (but in a direct connect it can go to 57600). If your modem will support 14400 and the phone lines are good enough, set the Logger to 14400 baud using **Logger; Communication; Direct Connect (Null Modem Cable)** and after connection, **Logger Baud Rate...**

Setup The Remote (Logger) Modem: Connect the Logger modem to the PC with a null modem cable and, using a terminal program (such as HyperTerminal or Procomm), set the remote modem's baud rate to 14400 using the appropriate commands for that modem as stated in the modem manual. This "locks" the remote modem's baud rate by storing it into the modem's nonvolatile memory so that it cannot change.

Now hook the modem to the logger with a short connector or cable.

> ***TECH TIP:*** *25 to 9 pin adapters often make good logger-to-modem connectors.*

If locking screws are provided on the connector, use them to make sure that the connection does not come apart after you have left the site. Plug the telephone wire into the Logger modem and power cord into the modem.

> ***NOTE:*** *If your modem does not support 14400 baud, use any baud rate LOWER and change all of the settings above to match.*

TECH TIP: *Once you have a successful installation, NEVER use the Logger Baud Rate… function during a modem connection because if you do, you will have lost your ability to talk to the logger until someone goes out and does a direct connect to the Logger to change the baud rate back. The reason is that the modems are talking at (for example) 14400 baud and let's say you change the Logger baud rate to 2400; which you can do. Then as soon as the Logger accepts the change command you can no longer talk to it because the modem is still talking at 14400.*

TECH TIP: *Before going into the field, make sure you can do a telephone connection with the logger at your office using 2 phone lines. In some cases, certain modem combinations (PC and Logger) just will not work. We have had good luck with the US Robotics Sportster series modems. Remember, debugging is so much easier when you are in your office, comfortable, and no one is watching!*

TECH TIP: *If you want to use a shared telephone line where the building occupant also has access to the line for part of the day, a good way to do that is to use the logger modem manual to determine how to set the number of rings before answering. The usual command is S0=10. By setting the ring count to 10-15 rings before the modem answers, the building occupant will have time to answer before the modem does. After normal business hours when the occupants are not on site, the modem will pick up after the set number of rings. Do not use a shared line that is used 24 hours a day or that "rolls over" to an answering machine or service after business hours.*

TECH TIP: *When doing a field project, and after completing the installation, have someone call the Logger from your office while you are standing there watching it and make sure they can talk to the logger.*

ANSWERS TO THE MOST COMMONLY ASKED QUESTIONS!

Through conversations with **ELITE*pro***™ and **DATA*pro***™ Logger users, we have come up with a compilation of the *Most Commonly Asked Questions.* However, do not hesitate to call us you have any further questions not covered in this section.

My logger says it's an ULTRAlite but my manual says DATApro™. What's the difference?

None. The **ULTRA*lite*** was renamed in January 2002 to better describe its functions and indicate that it is part of the "PRO" family of products.

Why aren't my PC and Logger communicating?

There are four items to check when this occurs. First, check to see if the cable is securely attached to both the RS-232 port on the logger and the serial port on the PC. Second, check to see that the cable is the DENT INSTRUMENTS supplied null modem cable (a standard RS-232 cable will not work). Third, make sure the correct communication port in the computer software is selected (use **Tools; PC Setup…**). Fourth, check the baud rate in the PC Setup (in software)—it must match the logger setting. Try the different baud rates. If none of these suggestions work, call a DENT Instruments Troubleshooter for further assistance.

How can I change the time and date formats with my Logger? Software?

ELOG 99b supports the Windows international date and time functions. With Windows 95 use: Start, Control Panel, Regional Settings to set the date and time format for your area. The data will then be in the new format. You need only change the Regional settings once.

How much flexibility do I have when configuring the channels?

A Lot. You can configure the channels any way you want. You can choose any combination of power, VARs, power factor, volts, amps and VA {**ELITE*pro***} or other sensors that the logger allows {**DATA*pro***}. You may also record average, minimum, maximum or instantaneous values. Only one or all four. The only limitation is the number of channels in the logger and the logger memory.

How many records can the Logger store? How long can my monitoring session last?

The **ELITE*pro***™ and **DATA*pro***™ Loggers can store about 25 000 individual records (about 100 000 for the high memory option). The length of the monitoring session depends on the number of channels that are active, the number of recording flags that are set, and the integration interval. The PC software will calculate the length of the recording session for any Setup Table you define.

EXAMPLE: If all four channels monitor kW and collect data once every fifteen minutes, in this case the memory will fill in 55 days. If you monitor kW, Amps, and power factor every fifteen minutes, the memory will fill up in 23 days. If only two channels are used to monitor kW, Amps, and power factor, the memory will fill in 41 days.

How do I configure a channel?

Configuring a channel is very easy. Simply create a Setup Table, which can be done from the software. A Setup Table defines how each channel is configured so the Logger will know which items to monitor during the study. Using the computer software you can create any number of Setup Tables by saving them to your hard drive.

When I view the real-time channel values, why are there non-zero values for channels I have turned on even though I haven't connected a current transformer?

The reason is because the logger is picking up noise. These values are erroneous and should be disregarded. Note however, anything shown in the real-time display will be recorded.

How does the Logger talk to the computer?

Communication between the PC and the Logger occurs when the RS-232 cable is connected to the logger and the computer. Using the Logger software, the logger and computer are ready to communicate. Or, if you are remotely accessing the logger via a modem, simply call the logger using the software and you are ready to communicate.

What is a Predefined Setup Table? {**ELITE*pro***}

To speed channel setup, four tables have been saved to the hard disk with the software installation program for your convenience. These tables can be temporarily modified by the user.

When I am monitoring a load that requires more than one channel (such as a 3 Phase - 3 Wire Delta load), which channel shows my totals? {**ELITE*pro***}

When using more than one channel for one load, the results from each channel have to be added together to obtain the total power consumption. This is done using the computed channels 5 and 6.

What happens if the power goes off for a considerable amount of time during my study session?

Not much. The logger switches over to internal battery power and will continue to record zeros for the values. The sensor sampling rate in the logger becomes once per minute instead of once every three seconds when on external power.

How important is it to connect the Neutral and (if so equipped) Ground wires when monitoring power loads? *{***ELITE*pro***}*

Always *connect the Neutral and Ground wires! This is both for safety and for proper operation of the logger.*

How many 3 phase, 3 Wire Delta loads can I monitor with the ELITE*pro*™ Logger? How many 3 Phase, 4 Wire WYE loads?

The amount of channels you will need depends on how many CTs the load you are monitoring requires (one CT per channel). A general rule when figuring out how many CTs you will need is to subtract one from the amount of wires in your load. For a 3 phase, 3 Wire delta load, you will need 2 CTs (3 Wires - 1). For this case, two 3 phase, 3 Wire delta loads can be monitored concurrently. For a 3 phase, 4 Wire WYE load, you will need 3 CTs (4 Wires - 1). One-3 Phase, 4 Wire WYE load can be monitored by the ELITE*pro* Logger (you will have one channel remaining).

However, if the load monitored is balanced, i.e., the phase voltages are equal and the phase currents are equal, then it is possible to monitor multiple 3F loads. Use one CT on one phase and one voltage reference from that phase to the reference phase. For a three-phase delta load, the voltage reference should be phase to phase. Use 1.73 for the PT value in the setup table.

For a three-phase four wire load, use one CT and reference the voltage from that phase to neutral. Use 3 for the PT value.

Can I use the ELITE*pro*™ to monitor 400 Hz (military) loads?

Yes! Simply set the logger to 50 Hz on the first page of the Setup Table. At 400Hz, the logger will sample at 16 times per cycle. This method works very well as long as there is little harmonic current beyond the 7th harmonic (2800 Hz).

Will the ELITE*pro**™ *Logger meter 600V loads?

The logger is capable of continuously metering 600 volts. Metering voltages above 600 volts can cause excessive heat to build up, damage to the Logger and extreme danger to the user. When measuring higher voltages use a properly rated instrument grade step-down transformer to reduce the voltage to the Logger to under 600 volts.

When I compare the ELITE*pro**™ *measurements on three phase loads with another meter, I notice that the watts and VARs agree but VA and Power Factor do not, why?

The usual reason is that the two meters are not calculating VA and Power Factor in the same way. Some meters include harmonics in the calculation and some do not. The **ELITE*pro***™ can do both depending on whether the 2 watt-element method is being used (does not include harmonics) or the 3 watt-element method (does include harmonics). See also the section **USING THE 3 WATT-ELEMENT METHOD ON A 3-WIRE DELTA SERVICE**

I am using an ELITE*pro**[tm] *(or DATA*pro*) with the 14400 baud internal modem and I am having difficulty connecting from my PC.

Some older PC modems have a problem connecting at 14400 when used with the default Windows settings. What happens is the PC and logger will connect at 14400 but error message says the logger can't be found. To correct this, change the PC modem extra settings by adding AT+MS=10,0,4800,14400. Note that a PC modem with this setting will not connect at 2400 baud or below.

To add this setting, use Start | Settings | Control Panel | Modems | Properties | Connection | Advanced… | Extra settings…